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This Month's Cover

For brilliance of colour in the flower garden few subjects can equal a massed display of tulips. On the farm of Mrs. A. Grant at Waimate the effect is heightened by row upon row of flowers that cover acres. Part of this tulip area is shown on this month's cover, which has been reproduced from a colour photograph by Tom Lloyd. Each year thousands of visitors from all parts of the South Island come to see the tulips in bloom on the Grant farm, "Craigburn", which are at their best early in October. Though some blooms are sold, the principal aim is the raising of bulbs, which are sold throughout New Zealand and sometimes overseas.

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Sugar Sprays Aid Fertilisation of Plums by Bees

THE principal role of the honey bee (*Apis mellifera*) in New Zealand's economy is not, as may be supposed, the production of honey and beeswax, but the pollination of economic plants and trees for the production of seed and fruit. Rapid agricultural development in this country has so depleted the numbers of wild pollinating insects that growers of seeds and fruits needing insect assistance in pollination must now depend almost entirely on the services of honey bees for this important function. Because the nature of plum pollen precludes its distribution other than by the agency of insects, honey bees must play an increasingly important part in the fertilisation of this fruit. In this article D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, describes how sugar syrup sprays can be used to encourage honey bees to visit plum blossoms despite the greater attraction of other nectar and pollen sources.

IN its many varieties the plum is widely grown throughout the Dominion both by commercial and home orchardists. Many popular varieties are reasonably consistent croppers, but the crops of others even in the best of conditions are erratic or consistently light and uneconomic. The fulfilment of the requirements of culture, nutrition, disease and pest control, and location and the provision of compatible varieties for cross-pollination where necessary are essential to secure the best results from any variety. A further requirement of very great importance and the fulfilment of which is essential to all varieties is pollination, which is the transference of the pollen from the anthers to the stigma of the plum blossom. Until this occurs the plum blossom cannot be fertilised and begin its natural development into the mature fruit.

The pollen of plum is generally moist and sticky and little or none is carried by wind. Insects are practically the sole means of its distribution and of all insect species found to visit plum blossom bees form by far the greatest number. In a series of observations made continuously throughout the seasons 1951 to 1955 on the factors influencing the setting of plum crops in Auckland it was found that of the 36,968 insect visitors counted on a group of observed plum trees 36,588 or 98.97 per cent. were honey bees.

These observations, made in areas apparently eminently suitable for the development of most forms of insect life, emphasise the extreme importance of the honey bee to the pollination of plums.

Because plum pollen is not wind borne, varieties requiring cross-pollination cannot be expected to set crops unless an ample force of pollinating insects is available. Even in self-fruitful varieties the assistance of insects toward the transfer of the pollen from anther to stigma is essential if good crops are to be expected.

Though plum trees when in bloom usually produce a magnificent show of blossom which often yields much nectar and pollen, it does not necessarily follow that honey bees will be attracted to it. The degree to which honey bees are attracted to any nectar is largely governed by the percentage of sugar it contains. Thus a nectar containing 40 per cent. of sugar, even though it is yielded by plants a mile or more distant from the apiary, will be preferred to one containing 20 per cent. of sugar which is being secreted by plants immediately adjacent.

All pollens are not equally attractive and honey bees prefer the pollen of many other plants to that of plum. The factors determining this preference are not yet fully understood, but it appears to extend to more than simple differentiation between species of plants. In plum of different varieties the pollen exerts varying degrees of attraction, some being comparatively freely sought and others, even though apparently similar in all respects, being entirely neglected.

The sugar concentration of plum nectar, depending on the degree of relative humidity and the air temperature, varies from 1 per cent. to 32 per cent. When the nectar is being secreted freely the sugar concentration is usually low. It seldom reaches the higher figure until evaporation is so far advanced that the amount present is most minute. Many other plants freely yield nectar of much higher sugar concentration than this and consequently will be frequented by bees in preference to plum.

In Auckland it was found that competition from manuka (*Leptospermum scoparium*), kowhai (*Sophora microphylla*), *Hakea saligna* used as shelter and hedging, and various forms of brassica was intense, so much so that on many occasions the bees from colonies located within the plum blocks deserted the plum entirely in favour of the nectar from these plants. Pollen from gorse (*Ulex europeus*), the brassicas, and various other plants was generally preferred to plum pollen.

Because of these natural preferences of the honey bee it is obvious that the provision of colonies of bees in a plum orchard, though undoubtedly contributing to better results than would be obtained in their absence, does not guarantee that the full pollination service desired will be received. Orchards without bees located in or immediately adjacent to them will be at a grave disadvantage, particularly when competitive sources of nectar and pollen are plentiful in the locality.

Because honey bees are seldom interested in gathering nectar of less than 25 to 30 per cent. sugar concentration for conversion to honey, the absence of competitive nectar sources does not mean that plum will receive the undivided attention of the bees. Owing to its low average sugar concentration plum nectar in some circumstances may be ignored by bees even in the complete absence of other sources. If there are no other pollen sources, the bees will gather the pollen of some plum varieties, but will generally revert to more favoured plants as soon as these begin to yield.

Viability of Pollen

Only a limited proportion of the pollen yielded by plum is viable and the period during which viability is retained may be from a few hours to a day or so. Variations in weather greatly influence the viability of plum pollen and if the temperature suddenly falls, as often happens during the plum blossoming period, the time in which pollination could be effected may not be more than a few hours altogether. In view of this it is particularly important that where cross-pollination is essential the two varieties are situated as close together and bloom as nearly simultaneously as possible. Pollinating insects must also

Within an hour after the plum blossom in the trial was sprayed the average number of visitations of bees increased from 6 to 300 per large tree.

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be present in quantity throughout this period if sufficient pollen transfer is to occur.

Period of Maximum Attraction

The maximum attraction of plum to honey bees occurs when the trees are at, or very near to, full bloom and continues only until the onset of petal fall. Once petal fall has reached some 15 to 20 per cent. the bees rapidly lose interest and few further visits are made.

Plum trees reach considerable size and consequently offer large areas of forage to visiting honey bees. Where trees are present in considerable number the visiting honey bee will be able to secure a full load of pollen or nectar from one tree and is likely to confine its attentions to that tree alone. The movements of bees from tree to tree so necessary to good cross-pollination may thus be very restricted when trees are large and blossoms are plentiful.

Trial Application of Sugar Sprays

It became apparent during the course of these observations in Auckland that the lack of great interest in plum displayed by honey bees, together with the presence of plentiful competitive sources of nectar and pollen, was one of the main factors responsible for the erratic and poor setting of certain plum varieties. The lack of interest continued even when vigorous healthy colonies of bees were placed immediately among the plum trees. Bees from these colonies were often seen to desert the plum entirely in favour of richer competitive sources. Even when competitive sources were relatively few or were failing to yield, only a minor proportion of the field bees of the colonies was found to be working plum. It was considered that the numbers of bees frequenting plum were obviously insufficient to effect the required pollen transfer on varieties of a poor cropping habit or on those requiring cross-pollination.

In an attempt to overcome the attraction of competitive nectar sources and to stimulate honey bee visitation to plum a series of sugar sprays was applied to groups of certain observed varieties in the seasons 1954 and 1955. In 1954 one group only was treated, the sprays being applied to Purple King and to presumed pollinators, Wilson's Early, Alpha, and Masterpiece.

Before the application of the sprays only 6 bees per large tree were found on an average on the observed trees despite the presence of two strong colonies of bees 25yds. away and further colonies 200yds. to 500yds. distant.

First applications were made at a sugar concentration of 38 per cent. There was an immediate reaction from the bees of the colonies in the orchard, visitations to the sprayed trees rising from the previous average of 6 per tree to over 300 in the course of an hour. After a further application visitations rose to 500 or more. Sprays were applied twice daily to these trees throughout the blooming period of Purple King, the sugar concentration being progressively reduced until it was finally stabilised at 20 to 25 per cent. Bee visitations to the sprayed trees remained consistently high throughout the period. Adjoining trees of Purple King and other varieties also received greatly increased attention from the bees and benefited accordingly.

In 1955 the scope of the trial was increased and two other groups in separate orchards were treated. To ascertain the minimum sugar concentration which would prove effective sprays in this year were applied at concentrations ranging from 6 to 20 per cent. Concentrations of less than 20 per cent. proved ineffective.

Experience to date indicates that sugar concentrations of less than 25 per cent. are not to be recommended where competitive sources of nectar exist. Sprays of 20 to 25 per cent. should be satisfactory where there is no competition from other plants. To gain the best advantage from the sprays they should be applied twice daily. Late morning and early afternoon are the most suitable times, as pollen release from the anthers of the blossoms is then apparently at its maximum. The object of these sprays is to attract bees to the blossom so that in their search for the syrup they contact the anthers and pick up the pollen grains on their body parts.

A bee visiting blossom at the time of day when pollen release is greatest is far more likely to make an effective transfer on subsequent visits than one which enters the blossom at times when pollen is not readily transferable. The high humidity generally experienced in the early morning and late afternoon of spring

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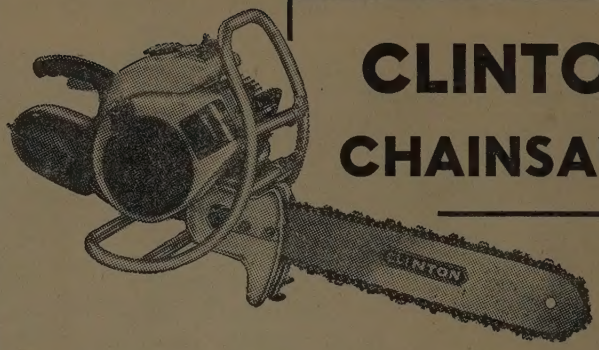

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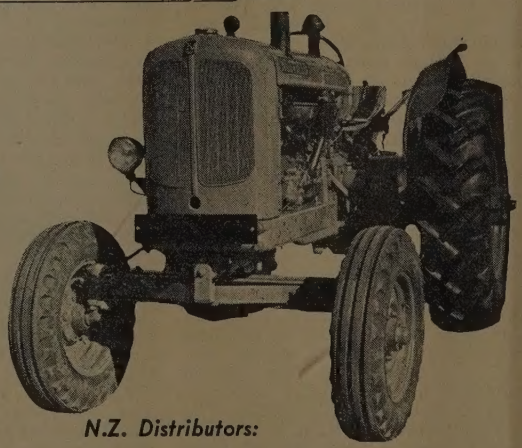

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days largely prohibits the free release of pollen in plum at these times.

Bees captured on plum blossom in early morning and late afternoon and examined under a field microscope were found to carry only relatively few pollen grains compared with those captured during the warmer and drier part of the day. Honey bees are much more effective as pollinators of plum when their visits coincide with the period of greatest pollen release.

Distribution of Pollen by Bees

Bees visit the flowers of plants with one or the other of two main objects—to secure nectar or pollen. In the internal organisation of the bee colony there are very marked divisions of labour, bees at certain ages undertaking special tasks. The adult worker bee is generally confined to work within the hive for the first fortnight of its existence. On the conclusion of this period it engages in various tasks in the field, collecting nectar, pollen, and water.

Though nectar-gathering bees collect some pollen as an incidental part of their activities, the main work of pollen gathering is carried out by bees devoted entirely to this task. These pollen-gathering bees are much more effective agents for the distribution of pollen than are nectar gatherers. A bee gathering plum pollen moves directly over the surface of the anthers and is soon covered with pollen grains, which adhere to the body hairs. Nectar-gathering bees may alight only on the petals of the flower and will normally pick up only a very few grains of pollen at each visit.

Though the honey bee when engaged in pollen gathering is undoubtedly the most effective distributor of plum pollen, the relative lack of attraction of plum pollen, combined with the low proportion of bees of an individual colony which will be engaged in pollen collection at any given time, makes it unlikely that pollen gatherers alone will provide the fertilisation required. Though nectar-gathering bees are individually less effective as carriers of pollen than pollen gatherers because their visits to plum blossom are numerically many times that of pollen gatherers and can be further increased some hundreds of times by the judicious application of sugar syrup sprays, their activities are of major importance to the grower.

Sugar Sprays and their Application

If sugar sprays are to be effective, they must be used daily and if possible twice daily. There is little advantage in applying them until the variety to be treated is at 75 per cent. full bloom. They can be discontinued when petal fall has occurred on 20 per cent. of the blossom, as most of the pollen will by then have been released and further visitations will have no particular value unless cross-pollination is needed and the pollinator is somewhat later in reaching the same stage of flowering. The sprays are a simple solution of pure, refined white cane sugar and water.

The following table shows the approximate amounts of sugar and water needed to make sugar syrups of varying concentrations of from 20 to 40 per cent.:—

Amount of sugar	Water	Sugar percentage of spray
9lb. 4oz.	4 gallons	20
12lb.		25
14lb. 8oz.		30
17lb. 8oz.		35
20lb. 12oz.		40

It is not necessary to spray the whole of a tree. Just moistening the blossom on one good sized fruiting arm is usually sufficient to bring about ample visitation to that tree. Where a row of trees is to be sprayed a similar treatment on alternate trees will suffice. Where cross-pollination is required both varieties must be sprayed simultaneously.

With this method and the use of a knapsack sprayer little more time, apart from that required for the preparation of the syrup, is taken than is needed to walk the length of the rows. For reasons of economy a nozzle giving as fine a spray as possible should be used. Coarse sprays cause considerable waste through run-off and attract the bees to the ground, where they are not wanted.

Where sugar sprays of 30 per cent. concentration and over must be used to combat the influence of competitive nectar sources some slight damage to blossom may occur, particularly in conditions of low relative humidity when evaporation is rapid. This damage takes the form of premature browning and wilting of the petals and reproductive organs. It does not seem to occur other than with sugar concentrations of 30 per cent. and more and then only when relative humidity is low. When applied as described above the area of blossom which would be affected is relatively small and any loss of fruit set from this cause should be more than compensated for by the increased pollination service and increased crop over all.

Distribution of Bee Colonies

The application of sugar sprays will not, of course, assist toward the fertilisation of the blossom unless there is an ample working force of bees available. The number of colonies of bees needed in plum orchards to ensure an adequate supply of pollinating insects at blossoming time will be governed largely by the varieties planted, the presence or absence of competitive nectar sources, and the layout of the orchard. Bee colonies to be able to provide satisfactory pollination services must be strong and vigorous. One strong, well-cared-for colony will provide a force of nectar- and pollen-gathering bees many times greater than that from a weak, poorly managed one.

To ensure good pollination service from honey bees to plum trees it is essential that colonies required for this work be given the best of management and brought to the maximum possible strength at blossom time. Weather at the time of plum bloom is often unsettled, with frequent cool, showery periods. In such conditions the flight of bees from even the strongest colonies is much restricted and weak colonies will have no bees available for flight, all inmates of the hives being required to maintain hive temperature and care for the brood.

When the distribution of colonies within the orchard is being arranged full consideration should be given to layout and aspect as well as to convenience of working. The hives should be situated in a sunny, dry position well away from draught and damp. If the orchard is divided into blocks by tall, dense shelter belts, it is better to place sufficient colonies to provide the required services in each block than to set the whole apiary on one site. In cool, wet or windy weather the bees are often reluctant to pass through or over tall hedges and when such weather persists over a great part of the blossoming period the necessary pollination service will not be achieved.

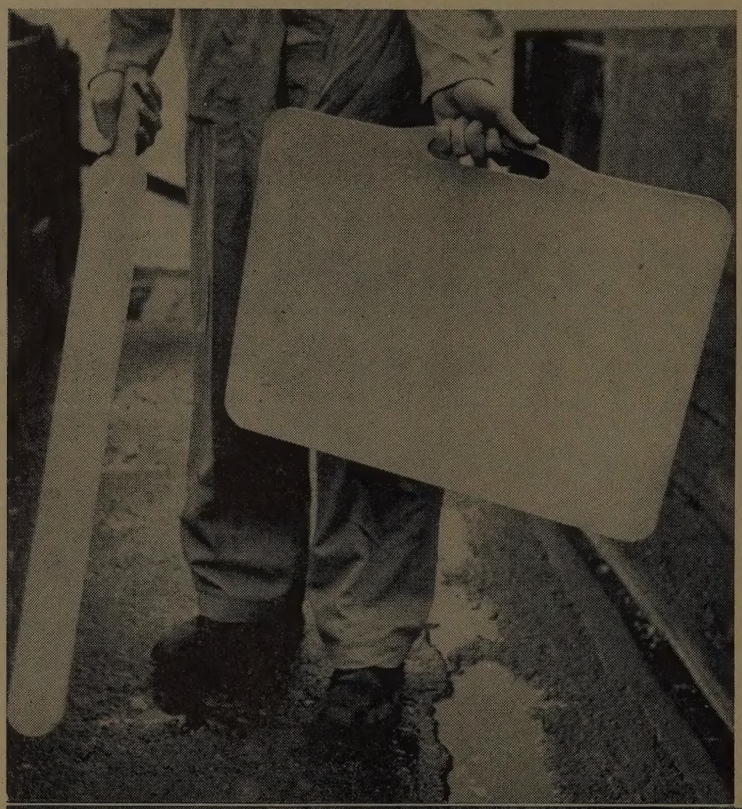
The number of colonies per acre necessary to ensure good pollination will vary with the varieties planted, the size of the trees, and the presence or absence of competitive sources. In most circumstances one vigorous colony per acre will meet all requirements.

Where colonies are not normally kept in the orchard, but are placed there only for the period necessary to achieve pollination, better service will usually be obtained if placement in the orchard is not made until the first varieties needing assistance are approaching full bloom. The immediate application of sugar sprays after the placement of the bees will then largely overcome the tendency of many of the field bees to seek richer natural sources.

It is not contended that the application of sugar sprays will ensure good crops irrespective of other factors. They will, however, help to overcome the lack of attraction to honey bees of plum blossom generally, and when they are properly applied and due consideration is given to the location of bee colonies and the presence or absence of competitive nectar sources they ensure that a greater transfer of pollen is achieved.

Photographs by Sparrow.

Use of Boar Board and Pig Bat Makes



A YEAR rarely goes by without some people being hurt while they are handling pigs, particularly adult boars at agricultural shows. In this article I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, describes how the handling of pigs can be made safer and easier by the use of a boar board and pig bat.

THE handling and control of adult pigs, particularly boars, entail some risk unless care is taken. People often get hurt, sometimes quite seriously, by pigs, and their injuries are the result of carelessness.

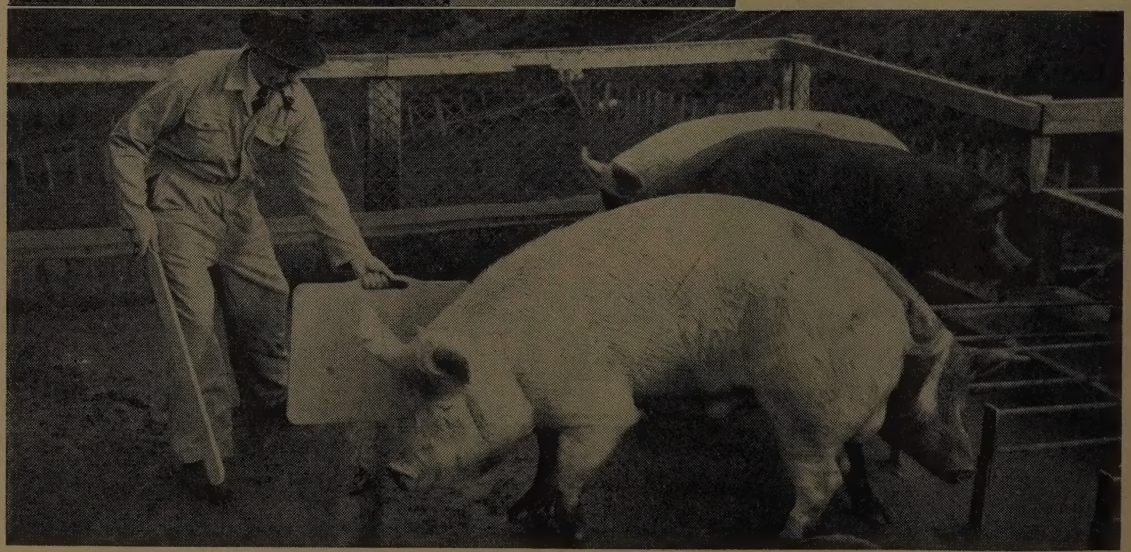
An adult boar is a large and very powerful animal, and even when he has been detusked, as all boars should be, he is still capable of inflicting a serious injury.

Risk of injury is particularly great at agricultural shows, where a pig can easily become excited by the sight and smell of other pigs that are strange to him.

In the United Kingdom two pieces of equipment are used in the handling of pigs, especially boars. They are known as a boar board and a pig bat, and are very useful in making the handling of animals easy and safe. Both are made of resin-bonded 5-ply wood.

← The boar board and pig bat, made of resin-bonded 5-ply wood. They should be painted to make them easy to clean.

↓ Cutting out a boar from a group of sows.



Handling of Pigs Safer and Easier

The boar board is 24in. x 18in. and has a hand grip in the centre of the top edge as shown in the upper illustration at left. The pig bat is 3ft. long and 3in. wide and has a shaped handle at one end.

Operation of Board and Bat

Easy and effective control of a boar is obtained by placing the board at the side of his head, when he will always turn away from the board. He can also be stopped if the board is placed immediately in front of him. Fights between animals can be stopped quickly if the board is placed between them.

A pig can easily be driven in any direction by the combined use of the board and bat. The board is used to maintain the direction, and the bat locomotion. The flat of the bat is used, never the edge; if the flat is used gently, it cannot cause bruising or any other damage, but it produces sufficient sting to keep the animal moving.

The bat and board are particularly useful for getting animals out of their pens on show grounds, and are infinitely superior to the large stick freely applied to the pig's snout, which is so frequently seen. In the narrow confines of a pen the attendant runs the greatest risk of injury, but if the board is kept between the pig's head and the man, this risk is eliminated.

Use at Shows

In the judging rings at agricultural shows pigs can be handled easily and quietly by this equipment. Exhibitors in New Zealand do not supply an attendant to each animal in the judging ring, as is the practice overseas; instead, the judge is usually accompanied by two stewards in the ring whose duty is to move the pigs as the judge directs. If these stewards were each supplied with a board and bat, they could handle the pigs with far greater speed, ease, and quietness than they achieve by the methods generally used at present.

This equipment is also very useful on the farm for such jobs as taking sows to the boar, removing pigs that are ready to kill from a pen containing other animals, handling sows and litters, and separating sows from litters at any time when this is necessary. The boar board and pig bat are cheap and easy to make, and their use makes the handling of pigs of all ages a much easier job.

Holding a pig with the boar board and bat. The animal can be stopped if the board is placed in front of its head.

To start the animal moving the board is placed on one side of its head and the pig is tapped lightly on the opposite flank with the bat.

Turning a pig with the boar board and bat. →

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THERE IS AN OLIVER DEALER IN YOUR DISTRICT

Borre, a New Sweet Blue Lupin Variety

By R. F. M. VAN STEVENINCK,
Crop Research Division, Department of Scientific and Industrial Research, Lincoln

A LIMITED quantity of seed of Borre, a new sweet blue lupin variety has been sown out this year with farmers interested in testing the crop. This seed was supplied by the Extension Division, Department of Agriculture, who multiplied it from nucleus material made available by Crop Research Division, Department of Scientific and Industrial Research, Lincoln.

IN 1948 a programme was started at the Crop Research Division designed to produce a sweet lupin variety which would be superior to New Zealand Sweet Blue lupins, released in 1942 (Black and Claridge 1942).

N.Z. Sweet Blue Lupins

New Zealand Sweet Blue lupins, which were expected to become a valuable alternative to rape for lamb fattening, never became popular on account of their erratic behaviour when grown under more or less adverse conditions.

Their main defects could be summed up as follows:—

1. The presence of a hard, water-impermeable seed coat made germination slow and irregular.
2. In many cases slow growth at the seedling stage resulted in weeds smothering the crop.
3. Green matter production was less satisfactory than that of Bitter Blue lupins when conditions were not optimal for growth.
4. Growth was generally too slow and maturity too late for the lupins to be successful in mixed sowings with other crops such as rape.
5. One of the most important faults was the variable seed yield, resulting in high seed prices and cost of sowing.

This list of defects shows that many improvements were necessary.

Methods to Obtain Improved Varieties

Two methods of obtaining improved lupin varieties are being used.

(a) A long-term breeding project involving hybridisation and selection work.

(b) The testing of many overseas varieties.

Better results could be expected ultimately by using the first method, as plants selected in New Zealand would be better adapted to local growing conditions. However, it was hoped that relatively quick results might be obtained by testing overseas varieties.

Borre Variety

Borre, a variety originating from the Swedish Seed Association (Svalof, Sweden), was introduced as a small seed sample in 1948 and has proved outstanding in trials. No "hard" seeds occurred, the plants developed more quickly, gave a better and more reliable green matter production, matured about a fortnight earlier, and consistently gave better seed yields than New Zealand Sweet Blue lupins. Borre, in fact, was indistinguishable from Bitter Blue lupins except for its sweetness (caused by the absence of alkaloids), which made the plants very palatable.

Table 1 gives some idea of Borre's performance as compared with Bitter Blue and New Zealand Sweet Blue lupins.

The seed yields during the multiplication period of 1952-1954 may appear to be low. This, however, was caused by the wide spacing between plants (rows 21in. apart) used to facilitate rogueing and to obtain maximum multiplication. In the 1951 trial Borre and New Zealand Sweet Blue seedlings were nipped off by birds and subsequently grazed by hares. This greatly reduced the yield. However, it can be seen that Borre recovered better from this damage than did Sweet Blue. The better recovery of Borre has been verified in a glasshouse experiment, in which seedlings were cut off 2in. above ground.

It is evident that recovery of Borre lupins was about twice as good as that of Sweet Blue lupins.

There is little difference between palatability and feeding value of Borre and of New Zealand Sweet Blue lupins. In fact, both are so palatable that precautions have to be taken to avoid vermin damage when the areas sown are small, or when large numbers of rabbits or hares are known to be present. At the Crop Research Division plots of 1 acre or more could be left unprotected without risk of failure, but in general bigger areas are advisable.

Cultural Practice

Though excellent advice has been given on the growing of sweet lupins in Agricultural Bulletin No. 154 of the Canterbury Chamber of Commerce (May 1942), a summary of cultural practice is given for those without this information.

The depth of sowing, though depending on the moisture status of the soil, should not be too deep. With good germination 1¾ to 2½ bushels of seed per acre should be satisfactory, and if used in a mixture about half this amount should be sufficient. To obtain greatest production for winter feeding sowing should be done in January or February. March and early April are the most favourable months for sowing for seed production. However, with lupins sown at this time in colder climates green matter production before and during winter is disappointing. Spring sow-

TABLE 1—YIELD COMPARISONS OF BORRE, NEW ZEALAND SWEET BLUE LUPINS, AND BITTER BLUE LUPINS

Spring sown 1950	Green weight in tons per acre (14 weeks after sowing)	Dry matter weight in lb. per acre	Seed yield bushels per acre
Borre	20.48	7,056	52.6
N.Z. Sweet Blue	12.79	4,682	43.2
N.Z. Bitter Blue	19.89	6,429	57.3
Spring sown 1951	**(16 weeks after sowing)**		
Borre	12.6*	5,150*	28.5*
N.Z. Sweet Blue	6.6*	2,790*	12.4*
N.Z. Bitter Blue	23.1	9,470	53.1

* Both varieties grazed by hares at seedling stage.

SEED YIELD IN BUSHELS PER ACRE (plants at wide spacings, rows 21in. apart)

Varieties	Spring sown 1952	Autumn sown 1953	Spring sown 1953	Spring sown 1954
Borre	32.0	29.0	15.7	25.3
N.Z. Sweet Blue	16.0	—	9.2	21.4
N.Z. Bitter Blue	—	28.7	—	—

TABLE 2—RECOVERY OF LUPIN SEEDLINGS AFTER REPEATED CUTTING TO 2IN. HIGH

Variety	1st cut at 2/7/52 grammes per plant	2nd cut at 31/7/52 grammes per plant	3rd cut at 28/8/52 grammes per plant
Borre	4.3	5.6	11.2
N.Z. Sweet Blue	2.1	4.0	5.8

BORRE LUPIN VARIETY . . .

ings, for both seed and fodder production, can be made during September or October, continuing until early December for fodder production only.

Highest returns of digestible fodder are obtained when the green pods reach full size and the lower leaves start to drop. As rapid deterioration then begins, it is advisable to start feeding off soon after the main spikes have finished flowering.

Borre competes well with most forages and so is superior in this respect to other Sweet Blue lupins, which are poor competitors; consequently it is suitable for use in association with other crops. For instance, a mixture of rape and Borre lupin appears to be a most valuable one.

Other mixtures of lupins with turnips for late autumn and winter feed, with Italian ryegrass for winter and spring grazing, with early sown oats for winter and spring grazing, or as a cover crop with early autumn- or spring-sown pasture are mentioned in Agricultural Bulletin No. 154. There are many possibilities, the selection of any one depending on district, rotation, and farming practice.

The harvesting of seed requires experience and sound judgment, as harvesting too late may result in shedding of a high proportion of the seed through bursting of pods, and harvesting too early may result in production of inferior seed. Care should be taken to avoid too high a moisture content of seed, especially during the storage period. Cutting the crop with the binder, followed by stooking, will give the highest returns of better seed, but picking up the crop from windrows or direct heading when the crop ripens evenly will probably be the cheapest.

It is expected that many farmers who try this variety will continue the practice that they have adopted with Bitter Blue lupins of saving sufficient seed to meet their requirements.

However, a warning is necessary about taking seed from crops heavily infected with diseases. Disease infection can cause serious damage when crops are undersown or when they have been grazed at an earlier stage. Many seed crops in early spring 1954 were a complete failure for these reasons. Anthracnose (*Ascochyta*), grey mould (*Botrytis*), and wilt (*Fusarium* and *Sclerotinia*) infections were prevalent in each case and seed harvested from such crops would have been risky to use for the next season. However, if there is no alternative to using bad-quality seed or seed from infected crops, application of a seed dust ("Phygon XL" or "Tetroc" at 2oz. per bushel) may give some control as well as a better emergence.

As there is no way of distinguishing Borre from Bitter Blue lupin in the field, care should be taken to ensure that they do not become mixed.

If results from the present release prove satisfactory, it is intended to supply small lots of pure seed periodically to the Extension Division for multiplication and distribution to farmers who will grow it for a seed crop under certification, thus maintaining supplies of pure seed for general use.

References

Black, M. A., and Claridge, J. H., "New Zealand Journal of Agriculture", vol. 65, pp. 69-70 (1942).

Canterbury Chamber of Commerce, Agricultural Bulletin No. 154 (1942).

Meteorological Records for July

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	51.8	+ 1.3	64.3	36.2	8.61	20	+ 1.22	2.04	13	125
Auckland	160	52.4	+ 1.0	62.4	39.8	7.63	20	+ 2.17	2.01	21	117
Tauranga	10	49.5	+ 0.8	62.4	32.2	7.19	16	+ 2.15	1.85	24	146
Ruakura	131	47.6	+ 1.1	61.5	28.5	5.38	20	+ 0.65	0.74	26	102
Rotorua	975	46.3	+ 1.1	59.8	29.3	6.05	12	+ 1.41	1.38	13	113
Gisborne	12	49.6	+ 1.9	63.9	30.9	7.43	13	+ 3.02	3.02	13	128
New Plymouth ..	160	50.2	+ 1.3	60.0	38.0	6.75	19	+ 0.39	1.74	9	119
Karioi	2125	40.4	+ 0.0	55.5	25.1	6.56	18	+ 2.37	1.50	14	
Napier	5	48.6	+ 1.3	68.3	31.4	4.77	16	+ 1.34	2.11	13	128
Wanganui	72	48.6	+ 1.0	62.5	33.8	4.21	19	+ 1.29	0.65	24	96
Palmerston North ..	110	47.2	+ 1.1	60.6	29.7	5.25	19	+ 2.21	2.34	14	89
Waingawa	340	45.2	+ 0.7	61.4	27.2	8.10	20	+ 4.16	2.88	14	107
Wellington	415	47.4	+ 1.1	59.1	35.1	9.98	19	+ 4.62	3.13	14	114
Nelson airfield ..	5	44.4	+ 1.1	59.0	26.2	1.25	15	— 1.98	0.29	9	146
Blenheim	12	45.6	+ 1.5	62.1	28.0	2.00	14	— 0.61	0.67	10	144
Hokitika	15	45.0	+ 1.4	58.0	28.0	9.68	15	+ 1.18	2.85	8	123
Hanmer	1270	38.6	+ 0.1	59.0	21.0	6.24	18	+ 2.04	1.20	14	87
Christchurch ..	22	42.9	+ 0.6	63.5	26.0	3.11	18	+ 0.51	0.67	26	102
Ashburton	323	41.8	+ 0.7	64.6	25.2	3.51	14	+ 0.89	0.62	26	111
Timaru	56	41.8	+ 0.4	59.6	26.8	1.51	11	— 0.22	0.30	16	120
Alexandra	520	37.4	+ 1.1	60.8	22.1	0.33	8	— 0.33	0.15	9	92
Taieri	80	41.0	+ 0.0	65.9	24.4	2.46	14	+ 0.52	0.38	11	100
Invercargill airfield ..	0	40.0	— 0.5	58.9	23.4	3.05	17	+ 0.24	0.71	5	109
Chatham Islands ..	140	46.9	+ 1.3	57.1	33.4	5.07	25	+ 1.49	0.83	14	

Show Dates

THE following are dates and venues of A. and P. shows from October to the end of January:—

NORTH ISLAND

October

12 and 13 October—Poverty Bay A. and P. at Gisborne.

17 and 18 October—Hawke's Bay A. and P. at Hastings.

*25, 26, and 27 October—Waikato A. and P. at Hamilton (Royal Show).

26 and 27 October—Wairarapa and East Coast P. and A. at Carterton.

November

*2 and 3 November—Manawatu and West Coast A. and P. at Palmerston North.

3 November—Tokoroa A. and P. at Tokoroa.

9 and 10 November—Whangarei A. and P. at Whangarei.

9 and 10 November—Wanganui A. and P. at Wanganui.

10 November—Clevedon A. and P. at Clevedon.

16 and 17 November—Egmont A. and P. at Hawera.

17 November—Bay of Islands P. and I. at Waimate North.

*22, 23, and 24 November—Auckland A. and P. at Auckland.

24 November—Waihi A. and P. at Waihi.

December

*1 December—Kaikohe A., P., and H. at Kaikohe.

1 December—Hauraki A. and P. at Paeroa.

8 December—Helensville A. and P. at Helensville.

12 December—Ohura Ram Fair at Nihoniho.

January

11 and 12 January—Wairoa County A. and P. at Wairoa.

18 and 19 January—Feilding I., A., and P. at Feilding.

22 and 23 January—Feilding Ram Fair at Feilding.

*25 and 26 January—Horowhenua A. and P. at Levin.

26 January—North Kaipara A. and P. at Paparoa.

30 January—Marton A. and P. at Marton.

SOUTH ISLAND

October

13 October—Ellesmere A. and P. at Leeston.

20 October—Northern A. and P. at Rangiora.

27 October—Timaru A. and P. at Timaru.

27 October—Amberley A. and P. at Amberley.

November

*1 November—Ashburton A. and P. at Ashburton.

*7, 8, and 9 November—Canterbury A. and P. at Christchurch.

14 November—North Otago A. and P. at Oamaru.

*14 and 15 November—Marlborough A. and P. at Blenheim (South Island Championship).

17 November—Courtenay A. and P. at Kirwee.

17 November—Waimate A. and P. at Waimate.

17 November—West Otago A. and P. at Kelso.

23 and 24 November—Nelson A. and P. at Richmond.

*24 November—South Otago A. and P. at Balclutha.

December

*4 and 5 December—Gore A. and P. at Gore.

8 December—Wyndham A. and P. at Wyndham.

*11, 12, and 13 December—Southland A. and P. at Invercargill (Centennial).

15 December—Tokomairiro A. and P. at Milton.

January

12 January—Blueskin A. and P. at Waitati.

26 January—Waiau A. and P. at Tuatapere.

30 and 31 January—Otago A. and P. at Dunedin.

* The Department of Agriculture exhibit will be staged at this show.

Effect of "Entramin" on Sexual Maturity and Egg Production of Pullets

THOUGH "Entramin" (2-amino, 5-nitrothiazole) has proved a satisfactory drug in the control of outbreaks of blackhead in chickens, it appears to have a detrimental effect on the egg production of pullets treated with it during the growing stage. To confirm this an experiment was carried out at the Department of Agriculture's Poultry Demonstration Plant at Upper Hutt, and a report on this experiment is given here by J. Edmondson, Poultry Experimentalist, Department of Agriculture, Upper Hutt, and F. C. Bobby, Superintendent, Poultry Industry, Department of Agriculture, Wellington.

Blackhead (infectious entero-hepatitis) has long been recognised as a disease causing serious loss in turkeys. At one time this disease was unusual among chickens, and their natural resistance was high. In chickens it was considered to be of no economic importance and benign in effect, and it rarely occurred as an outbreak.

In recent years a radical change has taken place in New Zealand. Outbreaks of blackhead among chickens have become more frequent and the severity of the disease has increased, causing heavy losses. This new situation brought need for a drug to aid prevention of blackhead and for treatment when an outbreak occurred.

The drug "Entramin" commonly used for the treatment of blackhead in turkeys appeared to meet the requirements, and has been widely used by poultry farmers.

Observations in the field have revealed instances of delayed sexual maturity and an indication of subsequent abnormal egg production in flocks where "Entramin" had been used at some time during the rearing season. A close examination of individual performance records of progeny test pullets at the Department's poultry plant with a history of "Entramin" treatment for blackhead appeared to support these observations. A definite delay in sexual maturity was noted, with an indication of abnormally low egg production. There also appeared to be some correlation between the age at which birds were treated and the extent to which they were affected.

It has been demonstrated by Pino and Hudson (1952) that 2-amino, 5-nitrothiazole when used at dosage levels common for treatment of blackhead caused delay in sexual maturity, and when used continuously at a prophylactic level completely inhibited sexual maturity.

It was considered desirable to demonstrate the effect of "Entramin" under controlled conditions and to investigate further the reproductive disturbances when it was used at prophylactic and therapeutic levels in the food at different ages; also to determine the effect of a higher intake level as could easily occur should the drug be unevenly distributed through the food owing to incorrect mixing.

This report presents some of the data on the investigation.

Procedure

All Australorp pullets used in the experiment were hatched on the same day from a mass-mated flock of hens at the Poultry Demonstration Plant. They were floor brooded and kept intensively throughout the experiment.

At 6 weeks of age the pullets were divided at random into 8 groups of 30 birds per group. All birds were maintained on an all-mash ration. The mash was made as follows:—

	lb.
Bran	27
Pollard	24
Wheatmeal	29
Ground oats	8
Maize meal	12
Meat meal	10
Dried buttermilk powder	5
Oyster-shell dust	1
Salt	½
Fish oil (2000 units of vitamin A, 200 units of vitamin D_3)	Pint ¼

Both these pullets were hatched at the same time and were reared together. The pullet on the left shows no sign of sexual maturity, but that on the right has a fully developed comb and wattles and is in full lay. No "Entramin" was given to the pullet at right, but that at left was dosed with "Entramin" at 13 weeks of age. The two photographs were taken on the same day, when both pullets were 23 weeks old.

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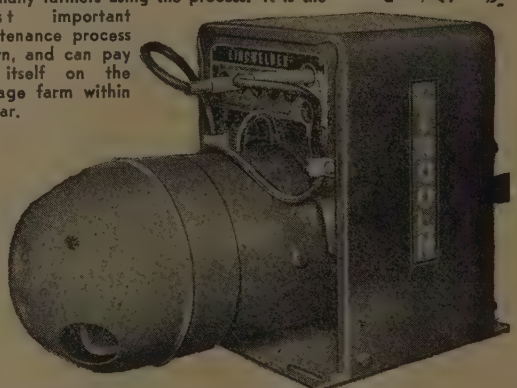

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Oyster-shell and flint grit were fed free choice, and fresh-cut green food was fed daily.

To this basic formula was added "Entramin" as a pre-mix to give dietary levels of 2-amino, 5-nitrothiazole as shown in Table 1. The age at which the drug was administered and the duration of treatment are also shown.

TABLE 1—GROUP DOSE LEVELS AND PERIODS

Group	Dose level	Dose period (weeks of age)
	Per cent.	
1	Control	Nil
2	0.05	7-13 (6 weeks)
3	0.05	13-19 (6 weeks)
4	0.05	Continuous
5	0.1	7-9 (2 weeks)
6	0.1	13-15 (2 weeks)
7	0.2	7-9 (2 weeks)
8	0.2	13-15 (2 weeks)

Food and water intakes were not controlled.

Records were kept of food consumption, body-weight changes, and egg production.

The experiment was continued until the birds were 40 weeks of age, and artificial lighting was not used at any time.

Results

Food Consumption and Body-weight

During treatments food consumption (Table 2) was drastically reduced in groups 7 and 8, receiving the highest level (0.2 per cent.) of "Entramin", irrespective of the age at which they were treated. Groups 5 and 6, receiving 0.1 per cent., also showed a marked reduction in the amount of food consumed, the reduction being midway between that of the groups receiving the highest drug intake and that of the controls. Treatment at 0.05 per cent. level did not appear to affect markedly the quantity of food consumed. Food consumption of groups showing a reduced intake while the drug was administered became nearly normal after treatment stopped.

Food consumption figures given in Table 2 indicate an abnormally high intake up to 13 weeks of age. This was because the type of food hopper in use caused wastage. A more efficient type of feeder was introduced at 13 weeks of age.

Retarded growth is to be expected among groups whose food consumption is reduced. Table 3 shows that body-weight gains coincided closely with the intake of food in each group. During treatment groups 7 and 8 showed little or no gain in body-weight. It appears that food intake with a 0.2 per cent. level of "Entramin" is sufficient merely for maintenance and does not provide for growth. In groups 5 and 6 weight gains at a 0.1 per cent. drug level were midway between those of groups at a 0.2 per cent. level and those of controls. Groups fed at a dietary drug level of 0.05 per cent. gave weight increases which were not appreciably different from those of the control group. Immediately treatment ceased in any groups showing retarded growth a rapid increase in body-weight was evident, bringing weight back to normal when compared with that of the controls.

Sexual Maturity and Egg Production

Table 4 is set out in detail to show the age at which each group began to lay and the weekly percentage production thereafter computed on a bird-day basis.

Group 1 (control) began laying at 22 weeks of age, production increasing to 55 per cent. at 25 weeks of age and to 75 per cent. at 28 weeks of age. Of particular interest was the effect of a 0.05 per cent. level of "Entramin" fed continuously to group 4. This group started to lay at 35 weeks of age and subsequent egg production was remarkably low.

Table 4 indicates clearly that a delay in sexual maturity occurs at all dosage levels, but that this is not as great when treatment is given at 7 weeks of age as it is when the drug is administered at 13 weeks of age.

Though delay in sexual maturity may cause a loss in the number of eggs produced to a given age (in this case to 40 weeks of age), rate of production when laying has begun could well be the same. Therefore in Table 4 the effect of "Entramin" on

TABLE 2—FOOD CONSUMPTION

Group	Dosage level	Dosage period (weeks of age)	Food consumption per period: 7 to 9 weeks of age lb.	9 to 13 weeks of age lb.	13 to 15 weeks of age lb.	15 to 19 weeks of age lb.
	Per cent.					
1	Control	Nil	66	180	81	193
2	0.05	7-13 (6 weeks)	65*	177*	76	173
3	0.05	13-19 (6 weeks)	67	178	76*	179*
4	0.05	Continuous	64*	182*	80*	168*
5	0.1	7-9 (2 weeks)	58*	186	81	193
6	0.1	13-15 (2 weeks)	68	181	67*	205
7	0.2	7-9 (2 weeks)	50*	176	80	201
8	0.2	13-15 (2 weeks)	66	182	46*	198

* Drug treatment period.

TABLE 3—BODY-WEIGHT GAIN

Group	Dosage level	Dosage period (weeks of age)	Body-weight at: 7 weeks of age lb.	9 weeks of age lb.	13 weeks of age lb.	15 weeks of age lb.	19 weeks of age lb.
	Per cent.						
1	Control	Nil	28	47	84	95	126
2	0.05	7-13 (6 weeks)	30*	47*	81*	95	128
3	0.05	13-19 (6 weeks)	28	46	84*	92*	122*
4	0.05	Continuous	29*	47*	81*	95*	121*
5	0.1	7-9 (2 weeks)	28*	40*	83	95	121
6	0.1	13-15 (2 weeks)	29	47	85*	92*	122
7	0.2	7-9 (2 weeks)	29*	32*	82	91	122
8	0.2	13-15 (2 weeks)	27	46	81*	78*	118

* Drug treatment period.

TABLE 4—SEXUAL MATURITY AND EGG PRODUCTION

Group	Dosage level	Dosage period (weeks of age)	Percentage weekly egg production (bird-day average) (weeks of age): 22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
	Per cent.																				
1	Control	Nil	4	16	36	55	55	66	75	74	77	74	71	72	68	67	73	74	74	71	67
2	0.05	7-13 (6 weeks)					6	15	33	50	54	53	48	48	48	53	54	55	53	52	50
3	0.05	13-19 (6 weeks)						3	6	26	40	53	46	49	50	47	48	47	49	46	45
4	0.05	Continuous														2	3	6	6	8	9
5	0.1	7-9 (2 weeks)			3	8	23	26	40	50	52	56	65	46	47	56	65	66	60	63	58
6	0.1	13-15 (2 weeks)					3	3	8	10	14	15	17	23	25	27	31	30	36	42	44
7	0.2	7-9 (2 weeks)							8	20	31	39	49	50	41	42	38	32	29	34	37
8	0.2	13-15 (2 weeks)									4	7	10	12	14	17	29	33	39	47	50

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
Average percentage production (bird-day)	62	42	40	1	47	22	35	20
Average eggs per bird	81	47	38	2	55	22	31	18

rate of production in addition to being given as a weekly percentage is also summarised for easy reference to show the percentage production for each group from the time that group began to lay. Group 1 (control) averaged 62 per cent. production, significantly higher than any of the treated groups. Group 4, receiving 0.05 per cent. "Entramin" continuously, averaged ½ per cent. production, a remarkably low figure. At each level of drug intake those groups receiving treatment at 7 weeks of age came into lay more evenly and gave a higher production than those treated at 13 weeks of age. This is most marked in groups 5 and 6 and in groups 7 and 8.

Above and below—Two groups of pullets photographed when the birds were 23 weeks old. The pullets shown above were treated with "Entramin" when they were 13 weeks old, and they show lack of sexual development when compared with the pullets from the control group (below) which have normal development and which are on the point of full lay.

Results demonstrate that the use of "Entramin" at any of the levels tested **not only retards sexual maturity, but also causes a reduction in the rate of production.** As both factors are of economic importance, the overall effect of the use of the drug is best measured as the average number of eggs laid per bird to 40 weeks of age as given in Table 4.

The results of this study indicate clearly that the drug 2-amino, 5-nitrothiazole detrimentally affects the reproductive system of Australorp pullets. Even when the drug is given at a prophylactic level of 0.05 per cent., recommended as a preventive, not only is sexual maturity delayed, but egg production is substantially lowered. At this low level of dietary intake sexual activity as demonstrated by sexual maturity and egg production is almost completely inhibited when the drug is fed continuously. Administration of the drug at 13 weeks of age had a more pronounced effect on sexual maturity and rate of production than at 7 weeks of age.

Attention is drawn to the fact that this study was not concerned with treatment of blackhead, but was an investigation into the effect of 2-amino, 5-nitrothiazole ("Entramin") on disease-free chickens.

Where it is intended to use "Entramin" to combat blackhead care must be exercised because of the detrimental reactions produced. When an outbreak of blackhead occurs it is strongly emphasised that **only the group of chickens directly affected should receive treatment.** It is considered unwise to use the drug as a preventive.

Because of the evidence supplied by this experiment the distributors of "Entramin" in New Zealand propose to withdraw this drug from the market and replace it with a similar drug which has proved under test in the United States of America to have no detrimental effect on the reproductive performance of pullets treated previously during the growing period. It is intended to test this alternative drug during the current season at the Poultry Demonstration Plant. It is possible that this new drug will be available to poultry producers for the control of blackhead during the current rearing season and it will be given the trade name of "Entramin A".

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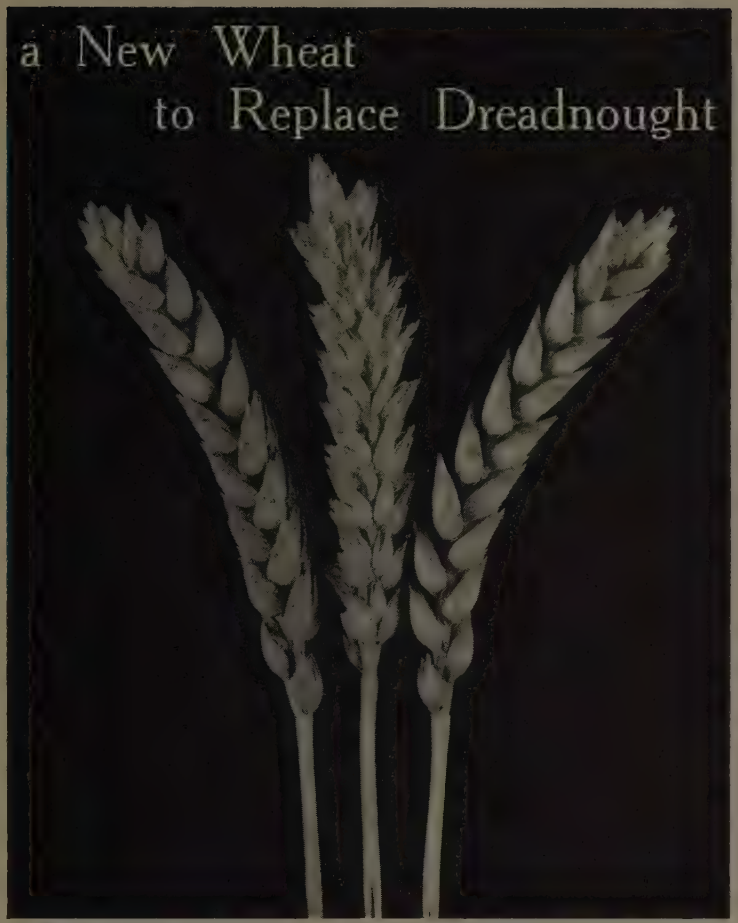
Arawa,

a New Wheat to Replace Dreadnought

FOR many years a new wheat has been required for the Dreadnought land of South Canterbury and North Otago, not because yields from these districts were unsatisfactory, but because the wheat grown presented many difficulties at harvest. The opinion generally expressed among growers had been that a wheat yielding from 5 to 10 bushels per acre less than Dreadnought would be acceptable provided that it could be direct headed. None of the other wheats available would come within this range of Dreadnought but many farmers had been growing Cross 7 or Fife Tuscan, though they knew that the average yields per acre were considerably below the potential yields of the land.

By L. G. L. COPP, Senior Plant Breeder, Crop Research Division, Department of Scientific and Industrial Research, and W. R. LOBB, Assistant Fields Superintendent, Department of Agriculture, Christchurch



Ears of Arawa wheat.

ONE of the important wheat breeding projects of the Crop Research Division, Department of Scientific and Industrial Research, has been the development of a suitable wheat variety for this area. The selection of a wheat to replace one of the highest-yielding varieties grown in New Zealand presented many difficulties. The new line had to be resistant to lodging and shattering, suitable for direct heading, and still retain much of the disease resistance and high yields of Dreadnought.

The new variety Arawa has been produced after many years of breeding and selection, and with the co-operation of the Wheat Research Institute, the Department of Agriculture, and the many farmers who have made land available for field trials.

Origin of Arawa

The wheats bred and released in New Zealand before 1955 were all derived directly from crosses of only two varieties, whereas Arawa resulted from a series of multiple crosses involving six varieties. In an endeavour to improve the baking quality of Tuscan this variety was crossed in 1932 with a high-quality wheat from India, and in the following year the hybrid was back-crossed to Tuscan.

The material was carried on in successive yield trials for the selection of a possible new variety. In 1940 one line from this material was crossed with Dreadnought for the further improvement of yield, and in the same year the short, stiff straw and good baking quality of Cross 7 were added to a rust-resistant selection from a cross between Kenya 744 and the Australian variety Federation.

The final cross, the combination of all six parents, was made in 1941. The single plant progenies from this cross were carried through preliminary yield trials, with the rejection of any inferior lines. Only one line was selected for field tests in 1950-51, but this line in 109 trials and 93 blocks over six seasons has proved to be a high-yielding variety.

Description of Arawa

The ears of Arawa wheat show a general similarity to Dreadnought. The main characteristics of Arawa set out in comparison with those of Dreadnought are as follows:—

Growth type: Erect; Dreadnought is semi-erect

Tillering: Not as profuse as Dreadnought

Heading: Earlier than Dreadnought

Ripening: Two to 3 weeks earlier than Dreadnought

Straw: Short; much shorter than Dreadnought

Head: Mid-long, dense, parallel, awnletted; similar to Dreadnought

Chaff: White, medium open; similar to Dreadnought

Grain: White; Dreadnought is light red

Lodging: Equal to Cross 7; much more resistant than Dreadnought

Shattering: Resistant; superior to Dreadnought

Loose smut: Not as susceptible as Dreadnought

Leaf and stem rust: As susceptible as Dreadnought

Mildew: Less resistant than Dreadnought, but superior to Cross 7

Yield: High; almost equal to Dreadnought

Baking quality: Better than Dreadnought

Quality

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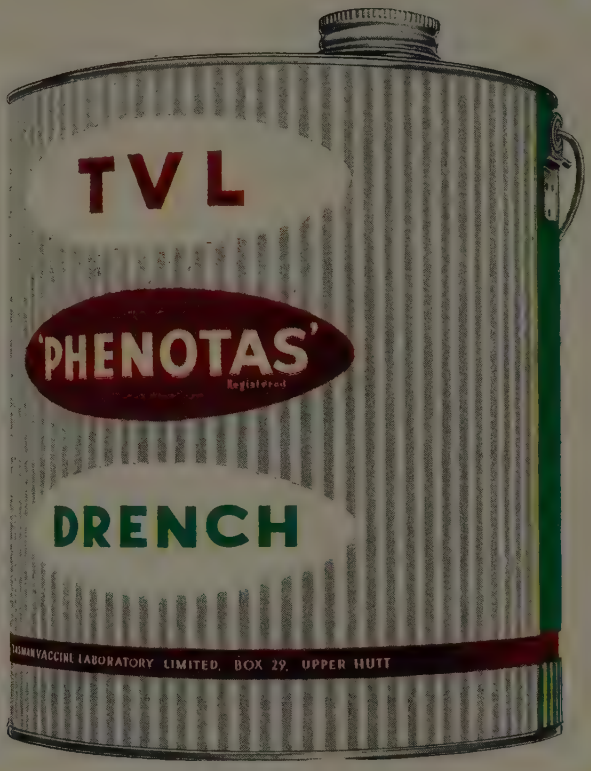
The quality of TVL products is well known to all interested in the protection of stock against the ravages of disease.



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Milling quality: Equal to Dreadnought

In all its main characteristics Arawa is different from Dreadnought. It does not lodge or shatter and may be direct headed. It is 2 to 3 weeks earlier in ripening and does not produce a bulk of straw. It has not the same degree of resistance to mildew.

Milling and Baking Quality of Arawa

Samples of grain from all comparative trials of Arawa, Cross 7, and Dreadnought were milled and baked at the Wheat Research Institute. In all, 111 paired tests were made, over the 6 seasons, and the baking and milling qualities of the new variety were clearly inferior to those of Cross 7. In the 33 comparisons with Dreadnought, however, Arawa has proved to be equal in milling quality and superior in baking quality.

Comparison of Yields of Arawa and Dreadnought

Location of trial	Yields (bus./acre) Dreadnought	Arawa	Difference in favour of Arawa
1953-54			
Kauru Hill ..	76	79	+3
Totara ..	61	45	—16
Weston ..	69	37*	—32
1954-55			
Hook	68	64	—4
Waihao ..	26	30	+4
Studholme ..	47†	43	—4
Willowbridge ..	48†	57	+9
Willowbridge ..	75	72	—3
Morven ..	54	43	—11
Hakataramea ..	45	59	+14
Otiake ..	33	27‡	—6
Ngapara ..	45	48	+3
Tokarahi ..	46	48	+2
Weston ..	45	30	—15
Kia Ora ..	54	50	—4
1955-56			
Hook	48	60	+12
Hook	54	66	+12
Hook	43	63	+20
Waimate ..	44	58	+14
Urutane ..	58	71	+13
Waihao Downs	30	47	+17
Studholme ..	66	71	+5
Willowbridge ..	50	45	—5
Willowbridge ..	60	89	+29
Morven ..	70	69	—1
Morven ..	67	70	+3
Morven ..	38	65	+27
All Day Bay ..	71	68	—3
Hilderthorpe ..	35	37	+2
Hilderthorpe ..	30	47	+17
Tokarahi ..	50	42	—8
Black Point ..	40	50	+10
Kokoamo ..	42	45	+3
Windsor ..	40	40	=
Windsor ..	40	56	+16
Weston ..	65	62*	—3
Maheno ..	50	64	+14
Kakanui ..	52	56	+4
Kakanui ..	62	63	+1

* Arawa grazed hard.
† Dreadnought direct headed.
‡ Bird damage to Arawa.

▲ The parentage of Arawa wheat.

How to buy

FIVE ACRES FOR A FIVER!

Pasture land left to greedy weeds soon loses its carrying capacity. Buying it back economically is the job for Weedone. Take Buttercup. One gallon of Weedone '57' (creeping and celery leaved) or Weedar M.C.P.4 (giant) costing less than £5 to spray, controls five acres of buttercup and allows lush green stock-fattening grasses and clovers to come away. You get similar economy with thistles, ragwort, docks (Weedone PEG) and most other pasture weeds. That's because Weedone varies its 2, 4-D formulations to break down the resistance of practically every weed type. In terms of extra profit gained, Weedone control is a real bargain!

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Genuine Weedone Products are recognised by this distinctive sign. Make sure you get genuine Weedone from your Weedone Service Distributor.

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Crop of Arawa wheat at Morven which gave a yield of over 70 bushels per acre.

Provided that commercial crops of Arawa are restricted to the areas where Dreadnought has been the main variety, the baking quality of the flour produced from New Zealand wheat should not be impaired by the release of the new variety.

Yields of Arawa

All hybrid lines bred at the Crop Research Division are tested by the Extension Division, Department of Agriculture, in field trials sown in the main wheat growing districts. These replicated trials consist of 36 to 48 small plots, each one drill width by 2 or 3 chains long. in which the yields of the new varieties are compared accurately with the standard varieties grown in each area.

The use of such trials has proved unsatisfactory, however, for the comparison of two varieties normally harvested by different methods. In trials including Dreadnought the Dreadnought plots grow tall and lodge badly, tangling with neighbouring plots, and frequently much of the grain is shaken.

A fair comparison can be made, however, by growing blocks of Arawa to be direct headed and in the same field blocks of Dreadnought to be windrowed and later threshed by a combine harvester with pick-up attachment. Officers of the Department of Agriculture arranged the growing of these blocks and the yields per acre of the two varieties are shown in the table on page 223.

The season 1955-56 was favourable to wheat crops during winter and early spring, but one of the worst droughts for many years was experienced in late spring and summer. Reports on the block trials by D. G. Reynolds, Oamaru, and J. L. Symons, Waimate, Instructors in Agriculture, indicate that Arawa was more able to withstand these conditions than Dreadnought.

Many of the farmers used the wheat for grazing and it was found that Arawa will stand heavy feeding and still produce high yields of grain. The most outstanding characteristic of Arawa was its ability to tolerate hot, dry conditions. Where other varieties matured and ripened off rapidly, with a poor sample of grain, Arawa continued to grow and mature normally with good, well-developed grain. The one crop sown in the spring yielded well and it would appear that provided soil moisture is adequate, Arawa may have a place as a spring-sown variety.

Only two farmers reported any shattering and in both cases it was very slight. The crops of Arawa were clean and free from any serious disease. Arawa grows a good flag, and this is quite important on some of the heavier cropping land for keeping annual weeds under control.

In all the block trials Arawa has been direct headed and has shown, over three seasons, that it is suitable for this method of harvesting.

It is necessary to stress that Arawa has been developed as a replacement for Dreadnought. In baking quality it is better than Dreadnought, but it is inferior to Cross 7. For this reason it is not recommended for growing on land which is normally sown to Cross 7.

The Crop Research Division, however, has a further hybrid line which seems likely to be suitable as a replacement for Cross 7. If the results of the trial at Lincoln last season are confirmed by the current series of trials of the Extension Division, farmers on country suited to Cross 7 will have available in the near future a new high-yielding wheat of satisfactory baking quality.

Summary

It may be assumed from the large number of satisfactory trials that the new variety Arawa is a good all-round wheat and will be much more acceptable as an alternative to Dreadnought than any of the other varieties available at present.

Because of the promise of Arawa and the interest shown in it the unusual course has been taken of building up a supply of uncertified seed and releasing it to farmers in the main Dreadnought areas.

Purified lines are also being multiplied, but it will take 2 or 3 years for these to be increased sufficiently to enable a release of certified Arawa seed wheat to be made.

Two of New Zealand's Worst Enemies

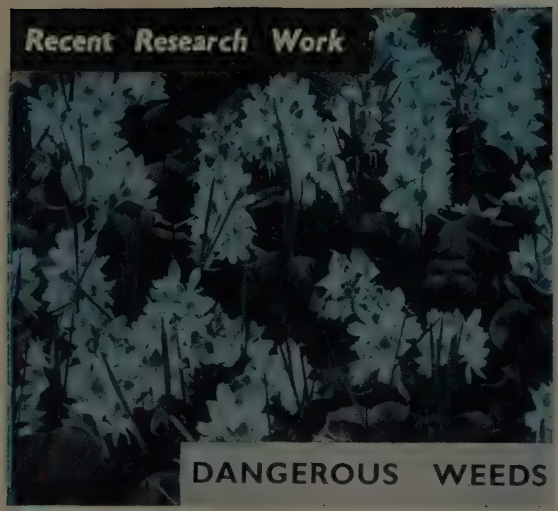
Plants liberated from fish ponds have caused most major infestations of water hyacinth in New Zealand.

A major infestation of water hyacinth on Lake Rangiriri, Waikato.

One plant of water hyacinth placed in a stream or pond will multiply rapidly and its growth will soon cover the water in a dense bank-to-bank smother of vegetation.

Chemical control of nassella tussock followed by oversowing with clover. Left—Heavy white clover growth on an area where nassella tussock was killed by TCA treatment. Right—Thick nassella tussock cover on an untreated area.

Left—Plot of nassella tussock treated with TCA. Middle to right—Plot treated with dalapon. Foreground—Improved pasture previously in nassella tussock. Background—Nassella tussock hill.



WATER hyacinth, nassella tussock, and Cape tulip are dangerous weeds, and this article describes recent work in their control.

WATER HYACINTH

This weed is undoubtedly one of New Zealand's worst enemies. To date 24 infestations are known, stretching from Opoua in the north to Wanganui and Shannon in the south. The control of this weed has been complicated by the fact that in at least 8 areas it is seeding freely. Its normal method of reproduction is by vegetative propagation. It is also treasured as an aquarium plant by householders, but because it multiplies so rapidly, it often becomes a problem to the owner. The thoughtless act of discarding unwanted plants into rivers, ponds, dams, and even lakes has led to most of the known infestations in New Zealand. The householder remains a potential distributor of water hyacinth, as no organisation exists that can make a house-to-house search for this weed.

MOBILE WEED TEAM

As early as 1948 trials indicated that water hyacinth could be readily killed with 2,4-D preparations. Early attempts to eradicate it failed except in one area. This failure is attributed to the lack of follow-up treatments and the fact that it was not realised that water hyacinth would set viable seed in New Zealand.

In 1955 two technicians were appointed to form a mobile weed team. This team has systematically sprayed and hand pulled all known areas of water hyacinth. The problem areas have been inspected six times in the one season. Since the mobile weed team came into operation many suspected areas have been inspected and all known areas are under control. The eradication of this weed now depends on how long seed remains viable.

NASSELLA TUSSOCK

To date 39 trials have been laid down in an endeavour to find a suitable method of controlling nassella tussock. In the past emphasis was placed on oversowing and manurial trials, all of which were largely ineffective. No species was able to compete satisfactorily with nassella. Grazing trials also indicated that desirable species were eliminated before the nassella was grazed sufficiently to control seeding.

In 1952 trials showed that nassella could be satisfactorily controlled with TCA. The original technique used was to apply light rates of TCA over a period of two or more seasons. The light rate of application usually resulted in the death of the nassella, but did not completely destroy the more desirable species such as clovers and danthonia. This technique did not allow the successful oversowing of desirable species, because subsequent applications usually destroyed the sown species. The action of TCA was found to be most variable, and complete kills of nassella were not always obtained.

In more recent work carried out by J. P. Beggs at the Wrekin near Blenheim TCA was applied at relatively high rates of 100lb. and 200lb. per acre in a times of application trial. The results of this trial and subsequent trials have demonstrated that nassella is fairly easily killed if TCA is applied during the hot months. This was an important result, as most of the previous work had been carried out in spring and autumn.

OVERSOWING

Once it was determined that nassella could be killed satisfactorily with one application of TCA, trials were started on the next more important step—replacing nassella with desirable vegetation to arrest further infestations. Oversowing and manurial trials were then conducted. The results of these trials have been spectacular. In the control plots (those plots not treated with TCA but oversown) the establishment of the oversown species has been poor or nil. In the plots treated with TCA an exceedingly good establishment of the oversown legumes has been obtained. The sown species covered the ground completely and arrested the establishment of nassella seed. The exceedingly good establishment in part may have been due to the temporary inhibition of all plants by TCA, which allowed the sown species to establish without competition.

USE OF DALAPON

TCA has some serious disadvantages, because its success depends largely on appropriate weather at the time of application for best results. With the development of dalapon, a chemical that is absorbed through the foliage of grasses in much the same way as hormone weedkillers, further trials have been started.

This chemical has shown greater promise than TCA in three trials. Lighter rates of application appear successful. Further work may show that this chemical is superior to TCA, because oversowing with desirable species could be made at the same time as the dalapon is applied. It also has a low toxicity to leguminous plants.

CAPE TULIP

Cape tulip is confined to Portland Island, Hamilton Bay (d'Urville Island), and Woolleys Bay (Whangarei). In 1945 an attempt was made to control Cape tulip on d'Urville Island by tree planting. An inspection made by the weed team last year showed that the Cape tulip had escaped the confines of the planted area. There was also a patch of about an acre growing in the planted area.

Trial work has shown that germinated bulbs of Cape tulip can be killed with oil-soluble esters of 2,4-D. This chemical is now being used for the main method of control, all areas on d'Urville Island being sprayed last year.

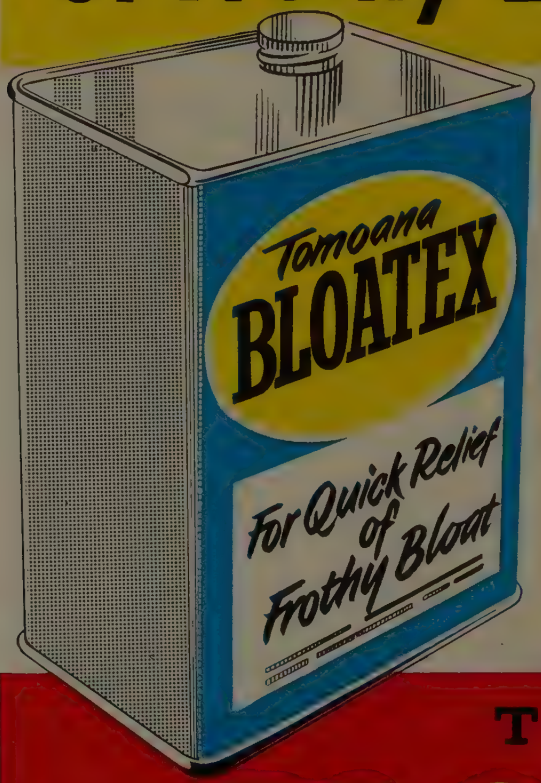
The major infestation occurs on Portland Island. Originally Cape tulip infested about 70 acres densely and a similar area was sparsely populated. Hand picking and spraying have successfully reduced the number of plants in the thinly scattered area and minimised further spread by wind-blown seed.

An excellent kill of most of the germinated plants was obtained in the thickly populated area by an over-all application of 2,4-D last year. A repeat spraying was also made to control surviving plants. The follow-up spray ensured that no plants set flowers or seed.

Bulbs counts made in the heavily infested areas reached the very high figure of 6 to 10 million bulbs per acre. Competition is so severe that only the bulbs in the top tier germinate in any one season. Any programme of eradication is necessarily long term.

—L. J. MATTHEWS

End the Worry of Frothy BLOAT



UNTIL the scientists can satisfactorily breed a strain of non-bloating clover we must face up to the necessity of controlling frothy Bloat, which is caused by present day clover rich pastures. "Bloatex" controls frothy Bloat with dramatic swiftness. In many cases a single dose acts in a few minutes. In most cases frothy Bloat is completely relieved in under an hour, so you can't afford to be without "Bloatex" this season. Available in one and 4 gallon tins, and in 44 gallon drums.

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Insecticides Applied to Crops in Flower Can Poison Bees

By A. D. LOWE,

Entomological Research Station, Department of Scientific and Industrial Research, Ashburton

THE problem of aphides, mostly *Brevicoryne brassicae* (L.), infesting seed crops of brassicas in spring is a long-standing one. These crops are planted in the summer or autumn of one year, stand through the winter, and seed in the following spring, being harvested about Christmas. Aphides which have overwintered in sheltered parts of the plant emerge and multiply in spring on the developing flower head. They usually girdle the main stem and cause heavy reduction in the resultant crop of seed.

IN the spring of 1955 there was a strong demand for some form of chemical control. During spring parasitisation accounts for only 1 to 2 per cent. of the aphides, predators appearing to be slow in exercising any degree of control at this time of the year, and part of the demand for control arose from an almost complete failure of chou moellier seed crops the previous season. There was an extreme shortage of this seed, and seed-contracting firms were anxious to ensure a good crop.

After inspection of certain crops it was agreed to dust them from the air with lindane at ½lb. of active ingredient per acre, to be applied as 8lb. of 6½ per cent. dust per acre. Arrangements were completed by the firm concerned to have the work done, but some delays occurred through lack of a suitable aircraft. Meanwhile the crops began to bloom, and the firm was further advised to delay treatment until after flowering because of danger to bees. Some plants were carrying a population of over 500 aphides per seed head, but others were very little affected.

Eventually, against departmental advice, crops were treated on Monday 26 September 1955. Seven crops of chou moellier in the Darfield area, 26 miles west of Christchurch and totalling 103 acres, were treated as arranged. At this time some bloom was appearing in the crops. Bees, all of which were the property of one beekeeper, were working all crops, the hives being 75 to 1000yds. from the various crops. Care was taken to see that no drift on to the hives occurred, and a dull, still afternoon when bees were not at work was chosen for the operation.

Disorganisation of Bee Colonies

The next day, Tuesday, was brilliantly sunny, and bees in large numbers worked all crops. It was soon evident that some damage had occurred and by Wednesday evening dead bees in alarming numbers were congregated at over 100 hives. Inspection on the Thursday showed the colonies to be totally disorganised. Severe damage had occurred in at least 60 hives and some 40 others were suffering badly. The hive entrances each contained a heap of dead bees and several showed rejected dead brood as well.

Supers could be removed and each hive inspected without any apparent opposition from the colony. Inspection on Friday by an apiary officer of the Department of Agriculture showed that hives which could normally be expected to house 50,000 bees had been reduced to 5000 or fewer, but that some recovery in organisation was taking place. By the following Monday the remaining bees showed signs of reorganisation and a semblance of returning to normal working conditions at greatly reduced strength. No queens appeared to have been killed, but several were noticed in distress.

To restore vigour requeening of some hives was resorted to. With this assistance all hives were working normally, but no honey could be taken in the autumn of 1956 from some 60 hives and less than usual from the remaining 40. As this beekeeper's expected production would be from 70lb. to 100lb. of honey per hive in a normal season, his estimated economic loss was at least 3 tons of honey. Added to this was the loss to farmers in the district through the decrease in pollinating agents.

Precautions Necessary to Avoid Recurrence

This story of damage to bees has appeared in newspapers throughout the country, so its facts are well known. An analysis of the less known factors in the occurrence has been made, and they indicate that attention must be paid to the following points if repetition is to be avoided:—

1. The benefit to the community of bees as pollinating agents cannot be too strongly emphasised. Though wind may play some part in pollination of certain crops, bees are the main agent in other crops and no farmer or commercial firm can afford to overlook this fact. All pesticidal treatments, whether applied from ground or air, should therefore be used with regard to this fact and adequate precautions taken to protect bees.

2. All insecticides used for the control of any pest should be regarded as dangerous to bees. There is only one safe rule in pest control; that is, to regard all insecticides as dangerous to bees.

3. An endeavour was made to ascertain the mode of action of the insecticide in this case. The bees killed were mostly young bees newly emerged. Chemical analysis showed that more lindane was present than is required to kill bees. No excessive number of dead bees was found in the crop.

These facts apparently indicate that forage bees were not greatly affected in the field by this comparatively low dosage of lindane (½lb. of active ingredient per acre). Damage was caused by their bringing contaminated nectar to the hive. This was fed to young bees, causing their deaths. In some cases dead brood (larval bees) was also rejected from the hives.

This danger of contaminating the nectar is an important point. It means that spraying or dusting with insecticides should never be carried out when crops are in flower. Some materials are offered for sale with the recommendation that they be applied "when bees are not working"; as for instance, in the late evening or on a dull day. This is a valid recommendation for some materials used as dusts or sprays for other purposes (for example, sulphur dusts used for fungous diseases), but it is not a safe rule for insecticides, which must not be applied when crops are in flower.

4. Some studies of bee behaviour were carried out in untreated paddocks and from these the following two points were noted.

(a) Counts made late in the season showed that each plant carried an average of 300 florets. When most of the flowering was over and open flowers averaged only one per plant, bees were still working the crop in considerable numbers. This is not surprising, for at approximately 60 plants per square yard 300,000 flowers are present per acre if each plant carries only one open floret.

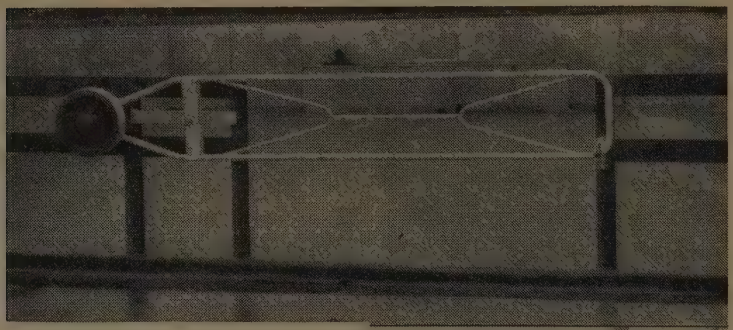
(b) At an even later stage of the crop, when bees would be thought to have given up the crop as a nectar source, they were found to return to it in the face of unfavourable weather. When heavy winds prevented their working more distant crops they utilised what would normally be regarded as a paddock of seed pods by visiting the few remaining florets and the surrounding weeds and hedges. Only when all flowering was over was it possible to be sure that bees were not working the paddock.

Both these points emphasise again that insecticides should never be applied in the presence of flowering plants.

5. Some insecticides are being offered to growers as "non-toxic to bees". These materials are being investigated and information will be given to growers when it is available. Some materials are being tested at present, and indications are that until further work has been done under New Zealand conditions, adequate precautions should be taken. At present there is no prohibition in New Zealand on the sale of these materials, the onus of taking adequate precautions being on the user. If in doubt, growers should keep in close touch with their local Instructor in Agriculture.

The foregoing indicates that the policy of both the Entomology Division of the Department of Scientific and Industrial Research and the Department of Agriculture is to move rather cautiously in this new field of insecticidal treatment of crops. If both growers and spray operators adopt a similar policy and keep in touch with the Department of Agriculture regarding new developments, beekeepers' interests should be adequately protected.

Dividing Gate for Milking Shed Yard



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—C. L. SYMAN,
Farm Dairy Instructor,
Department of Agriculture,
Wanganui

Book Review

"New Zealand Building Timbers": J. S. Reid

FOR those using wood for any condition of service the problem has always been to decide which of the various species will give the best service for the particular use, and also which is the best treatment for any species chosen.

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Availability, density, strength, hardness, nailing properties, durability, decay hazard, insect borer hazard, moisture content, and dimensional stability are all dealt with at length, as are practical problems including grading, seasoning, preservation, painting, and lamination.

Points on components for every section of a building such as weatherboarding, flooring, joinery, and framing are given in such a manner as to leave no doubt not only as to the best timbers to use, but also as to the best methods of treatment and utilisation.

The booklet also includes some useful tables and helpful illustrations.

As some timbers are in short supply, necessitating the use of alternatives, timber users cannot afford to be without this volume, which should always be on hand for reference.

—H.W.T.E.

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Turnips for Lamb Fattening in Northern Hawke's Bay

By E. C. AYSON,
Instructor in Agriculture, Department of Agriculture, Wairoa

THE fat-stock production survey of Wairoa County, published in "The New Zealand Journal of Agriculture" in September 1952, indicated that the decline in the numbers of fat stock and the quality of fat lambs being produced in the district could be attributed mainly to the deterioration of hill country pastures and to unsatisfactory results from fattening crops. Aerial topdressing, subdivision, and the application of improved management practices are proceeding apace, but it will be some years before the position is corrected. In the meantime the freezing company at Wairoa in co-operation with the Department of Agriculture has decided to explore the possibilities of increasing the number of fat lambs by using areas of pumice lands of the county for growing suitable fattening crops. This article outlines three seasons' results with crops at the company's property at Raupunga.

IN the spring of 1951 Swift N.Z. Co. Ltd., the company which operates the Wairoa freezing works, took over the lease of a Maori block at Raupunga not only to experiment on crops and pastures but also to develop economic methods of bringing the area into production.

The property is on the Putere road, some 35 miles from Wairoa. It rises 600ft. from the north bank of the Mohaka River to 1200ft. above sea level. There are 1600 acres in all, some 47 per cent. being capable of cultivation at least with tracklaying tractor equipment.

Typical of the country, the farm is broken up into separate sections by several large gullies, which makes management rather difficult. When the company took over the property about three-quarters of it had reverted to bracken fern, manuka, and blackberry, and the remainder was in rather indifferent pasture.

The farm is reasonably typical of a large expanse of pumice country in northern Hawke's Bay from Tutira in the south to Kotemaori and Raupunga; also through Putere and Ohuka to Hangaroa in the north. Further inland the pumice is coarser and of lower fertility, accentuating the problems encountered at Raupunga.

These soils are derived from Taupo volcanic ash and are generally markedly deficient in phosphate and nitrogen, and there is evidence of a cobalt deficiency. Potash levels are also low in many parts. The volcanic ash found nearer the coast and between the Wharerata Hills and the sea and also on the Mahia Peninsula is known as Gisborne ash. This is finer than the pumice soils, and of better quality, but with modifications the results at Raupunga could be applied to these areas as well.

Wind Erosion

Though working up of these soils is comparatively easy, cultivation can be a risky undertaking. Where the country is high or exposed, wind erosion of fallowed ground is a danger. This was vividly demonstrated in the first season at Raupunga, where a paddock which had been ploughed before the property was taken over was very seriously blown by strong north-west gales in late spring. An adjoining and equally exposed paddock which had been giant disced did not suffer. Giant discs have since been used for all initial cultivation on the farm with success, whether for grass or crop.

Cropping Virgin Pumice

The cropping of virgin pumice country in this area has proved un-

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successful in trials at Raupunga and at Ohuka. Crops of rape, chou moellier, kale, turnips, and also swedes, though establishing well, have in two consecutive seasons failed to make progress after 4 to 6 weeks. The foliage then turned yellow or bronze and plants remained stunted and poor for the remainder of the season in spite of adequate cultivation, consolidation of the seed-bed, and sufficient phosphate, potash, and lime. Even drilling fertiliser with the seed instead of pre-broadcasting and harrowing it in failed to have any effect.

A marked nitrogen deficiency was apparent, and sulphate of ammonia applied to the growing crop did have a marked effect for a short time, but at least 5cwt. per acre was required to produce even a reasonable crop; quite an uneconomic and impractical dressing.

In the 1952-53 season part of a kale manurial trial extended over an old fenceline into an area which had been disced out of a poor paspalum pasture. The balance of the trial area had been in bracken fern and blackberry. The difference was very marked, the crop on the area out of pasture growing green and vigorous to a height of 3ft. to 4ft., and the rest remaining yellow and stunted.

As a result of this and similar experience it has been decided to confine all cropping work on the farm to areas out of pasture. Some virgin areas have been sown to temporary pastures of Italian or short-rotation ryegrasses and cowgrass. By this means it was hoped to build up the fertility and in particular the nitrogen status of the soil within 2 or 3 years, and then to crop before sowing to permanent pasture.

Unfortunately the production from these temporary pastures has been very disappointing, permanent mixtures of ryegrass, cocksfoot, and white, red, and subterranean clovers at 30lb. to 35lb. per acre proving far superior, even out of scrub and fern. All virgin areas have now been sown to permanent pasture and only the old pasture areas have been cropped before regrassing.

TURNIPS FOR LAMB FATTENING

Sowing white-fleshed turnips on Swift's experimental farm, Raupunga.

Rape

Though rape has been the main supplementary fattening crop grown in Wairoa County, it has proved very

Crop of Green Globe turnips in Wairoa district.

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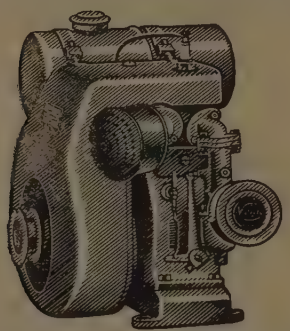

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uncertain for lamb fattening in the district. This is because of the frequency of wet summers, which delay or prevent the ripening of the crop. It is also very subject to aphis attack. One of the main reasons for establishing the crop trials has been to investigate the possibilities of replacing rape by other crops.

Sweet Lupins

Of value in other districts, particularly on light land, sweet lupins have been tried on pumice without success. For unknown reasons some germinations in trial sowings have been very poor, and even where establishment has been fair, resultant crops have been poor and lambs have failed to fatten on them.

Chou Moellier and Kale

Chou moellier has been used to a very limited extent for lamb fattening, but kale, following its successful use at the Manutuke Research Station at Gisborne, has been grown on the river flats in the county. On the other hand, on the pumice soils at Raupunga kale and chou moellier have been compared with other crops to their disadvantage.

In particular, on land out of pasture white-fleshed turnips have far outyielded kale and have proved of superior fattening value. These soils do not appear to be fertile enough to support worthwhile crops of chou moellier or kale. Kale is also at a disadvantage, being slow to mature and, in particular, is comparatively unpalatable to lambs. Lambs have been noticed to take a fortnight or more, after being turned into kale, before they touch the foliage. In palatability trials lambs preferred white fleshed turnips, leaving both chou moellier and kale untouched.

Turnip Tops Fatten Lambs

Very encouraging results have been obtained at Raupunga from fattening lambs on turnip tops. In the first season's trials under more or less average climatic conditions lambs on N.Z. Red Globe turnips averaged 0.48lb. liveweight increase daily per head over a period of 22 days. Those on areas of kale averaged 0.3lb. liveweight increase daily per head over a period of 44 days, and lambs on rape put on only 1.7lb. per head overall in 15 days, when they had to be removed because of aphis infestation. The comparisons between turnips and kale were not strict, however, in that the lambs on the turnips were weighed off long before the crop was finished.

The 1952-53 season proved very difficult for growing crops and fattening stock. Frequent showers and heavy falls of rain were experienced from July well into February. Most crops in the district were either drowned out or smothered by prolific weed growth. On these light natural-draining pumice soils crops grew very well. Trial sowings of white-fleshed turnips yielded up to 43 tons per acre on land out of old pasture. Kale yielded very poorly in comparison.

Stunted kale on land out of fern. A trial on Swift's development farm, Raupunga.

The season was very difficult for young stock because of the lack of sunshine. Growth was lush and worm incidence was high. The liveweight gains were small, but favoured the turnips. Rape this season was a hopeless proposition.

The following season was quite the opposite, well illustrating the variability of the Hawke's Bay climate. Drought conditions set in early in spring, and though there was just sufficient moisture to germinate the crops after they were sown in late October, it was only a fortuitous heavy fall of 1½in. of rain early in December that saved the then desiccated crops. These were ready for feeding off by Christmas, but yields were light, under 20 tons per acre being recorded. The trial areas were situated on high, exposed paddocks where scorching north-west gales soon completely wilted the foliage.

Even so, the lambs stocked in different paddocks, from 20 to 24 to the acre, did surprisingly well, daily liveweight gains averaging up to 0.75lb. over 21 days on one area of Red Globe turnips.

Turnip Varieties

A distinct variation between white-fleshed turnip varieties, both in yield and fattening ability, has been shown in these trials. The varieties compared are the standard Government-approved white-fleshed types, N.Z. Red Globe, Green Globe, Purple Globe, and York Globe.

In the 1952-53 season York Globe outyielded the others and in particu-

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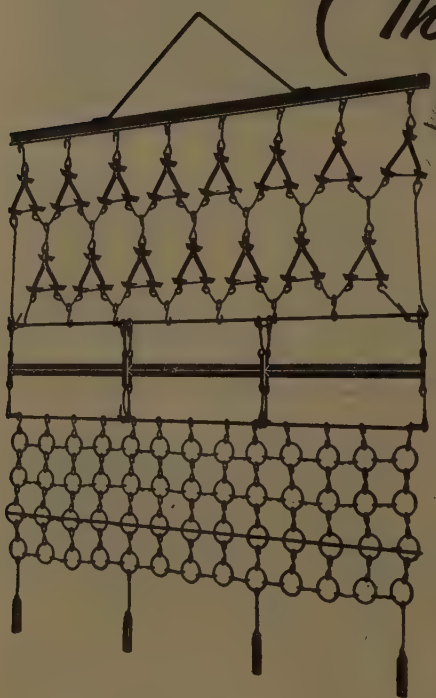

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Woolly lambs on a heavy crop of Green Globe turnips near Wairoa.

lar produced a greater proportion of root. The next season differences were less marked and at variance with the previous year, but some weighings of crops in other paddocks supported the previous finding that York Globe produces a heavier bulb. It is definitely an earlier maturing variety, ripening up to 2 weeks before the others.

The widest disparity in the varieties is in their fattening properties, Purple Globe in two seasons proving far inferior. Lambs definitely showed more relish for York Globe, having a particular liking for the bulb. The Purple Globe areas still had considerable leafage left at the completion of the trials, those of the other varieties having little left.

There appears to be little to recommend Purple Globe, whereas Red Globe and Green Globe are both recommended for general sowings. York Globe is recommended for late sowings where quick maturity is desired.

Manurial Trials

Potash is becoming deficient on some of the pumice areas. On Swift's farm applications of muriate of potash are showing pasture and crop responses. In the 1953-54 season a potash trial was conducted on white-fleshed turnips, where ½-acre areas of Red Globe were compared, treated with ½cwt. and 1cwt. per acre of muriate of potash in addition to normal superphosphate dressings.

Though visual differences were barely apparent, there was quite an appreciable yield difference in favour of the potash treated areas.

The lambs themselves responded markedly to the treatments, those on the 1cwt. per acre area consuming every vestige of foliage several days before those on the other areas. They were very much more lively and killed out far better than their counterparts.

Potash applications are expensive, and unless farmers know that their land is deficient, potash should not be applied until soil analyses have proved the area deficient.

Economic Aspects

Figures taken out for the 1953-54 drought year showed that to prepare the ground and sow to turnips cost £12 6s. per acre, and subsequent cultivation, fertiliser, etc., to sow to pasture brought the total cost to £22 8s. per acre. Twenty-four store lambs were purchased and fattened per acre on the turnip tops and the net gain on this transaction was £10 12s., which meant that the actual cost of establishing the pasture was £11 16s. The cost would be further reduced by allowing for the feed value of the turnip bulbs and any regrowth. Costs of direct grassing down came to £12 17s. per acre, which was more expensive than including at least one crop of white-fleshed turnips.

These costs were assessed on contract cultivation rates for tracklaying equipment and might be reduced by those operating their own tractors.

Notes on Turnip Growing

White-fleshed turnips are very easy crops to establish and stock provided a few simple rules are observed. In the first place adequate ground preparation is essential and a fallow period before sowing of 2 to 3 months is desirable. After an initial giant discing the pumice soils should be left without further working until 2 to 3 weeks before sowing, when tandem discing, harrowing, and rolling should produce a satisfactory seedbed. Consolidation is most important and the area should be rolled once or twice if necessary.

Adequate but not heavy manuring is required for turnips, and at Raupunga good results have been obtained by drilling 2cwt. per acre of cobaltised serpentine superphosphate with the seed and, to avoid seed injury, pre-broadcasting ½cwt. per acre of

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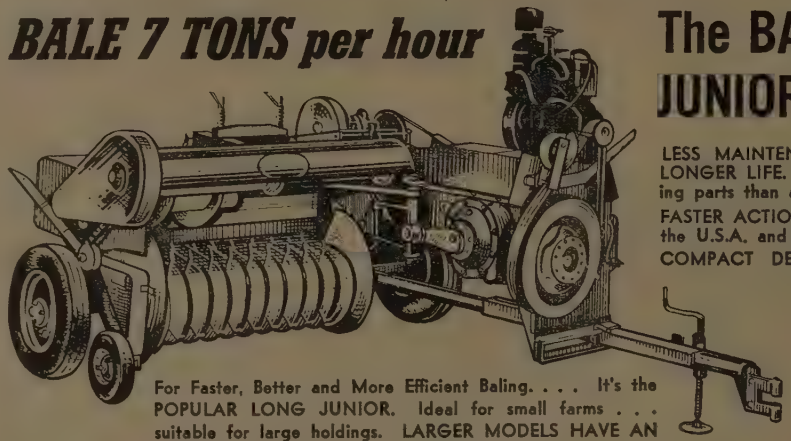

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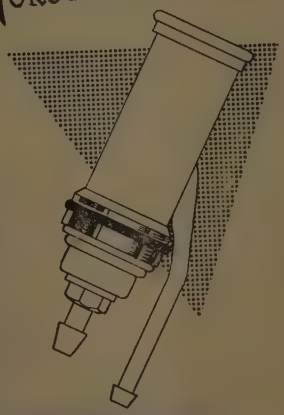

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muriate of potash with 12lb. of borax per acre. Lime has been found unnecessary on these soils.

Borax is required in small quantities to correct the mottled heart condition arising from a boron deficiency.

The addition of blood and bone at 1cwt. per acre has proved encouraging at Raupunga, where in one trial such a dressing increased the over-all yield by some 6 tons per acre.

A seeding rate of 20oz. per acre has proved satisfactory, giving a good balance of top and bulb growth. It is essential that the seed should be drilled in contact with the manure. Broadcasting and light harrowing are only an unsatisfactory alternative. Sowing dates for turnips are not critical, but the end of October-early November period seems to be about the best. Sowings can be made even in January or February in a wet season. Early spring sowings may be feasible, particularly in coastal regions where stock may be weaned before Christmas.

The crop takes 10 to 12 weeks to mature, as indicated by the colouring of the foliage. It is essential that lambs be turned on to the crop only after it reaches maturity, but once this stage is reached stocking should not be delayed. Where large areas are being sown it would be desirable to stagger sowing dates at fortnightly intervals and to break feed lambs in large mobs from one block to the next. The trial areas at Raupunga were stocked at 24 per acre for 5 weeks, but it was evident that this rate could have been increased to at least 30.

In a dry season lambs can be left on the crops long after the green foliage has withered up, as in the 1953-54 season trial lambs continued to put on weight even when only dried up leaf and stalk remained, with half-eaten bulbs. Lambs should be carefully watched, however, as trial work has shown that they will not continue to fatten on bulbs alone.

Neither run-off nor watering is required even under these conditions, and it is apparent that the provision of water reduces the intake of fodder, resulting in lower weight gains.

Turnip Bulbs and Regrowth

A distinct advantage of turnips is that once the tops have been disposed of by the lambs the majority of bulbs remain for feeding off to ewes or wethers. In an average season substantial regrowth can also provide valuable feed. In 1955 on the Raupunga farm, for example, some 500 ewes were fed on 20 acres of regrowth and bulbs for 4 weeks from the end of February. This provided valuable flushing feed before tupping, allowing pastures to be spelled or used for tail-end lambs.

Diseases

Apart from the mottled heart condition mentioned, turnips are subject to two major diseases. Club-root can cause trouble, and sowings following infected swede crops should be avoided. Soft rot can be very prevalent in a wet season, and once started will quickly reduce the bulbs into a putrid, squashy state. The only thing to do is to eat off the crop as rapidly as possible, and break feeding can also help, as undamaged bulbs are less susceptible to attack. Aphis can cause some damage to leafage in humid regions, but practical control is now possible with the use of the insecticide BHC. None of these, however, has given trouble on any turnip crop at Raupunga in recent years.

Fatten Forward Lambs Only

In all this trial work, where individual lambs have been earmarked and individually weighed, invariably the best lambs have made the greatest liveweight gains. It is recommended, therefore, that only forward lambs be put on to crops and that lambs losing condition after a period on crop should be removed at once. Cropping is costly, and a few poor doers can waste a lot of feed and reduce overall returns.

Dosing Lambs on Crop

Worm incidence can build up very rapidly in fattening crops, particularly in northern Hawke's Bay, where the large stomach worm, *Haemonchus contortus*, is very rife. Frequent summer showers and very high temperatures create a steam-oven effect underneath dense foliage. Lambs can then lose condition very rapidly unless regularly dosed. It is recommended that dosing be made a standard practice before putting lambs on to crop, except perhaps in a very dry season. Break feeding lambs on to clean crop would also assist in preventing worm build-up.

Turnips for Winter Feed

The foregoing remarks on turnips for fattening envisage heavier sowing than usual and the production of top growth rather than bulbs for feeding at this period.

In the comparatively mild climate of northern Hawke's Bay it is now apparent that white-fleshed turnips can successfully be utilised also for winter feed in the place of swedes. On Swift's property N.Z. Green Globe turnips sown late in February have produced crops yielding 20 to 25 tons per acre for feeding off in June and July.

These crops have proved very valuable for holding tail-end wether hoggets or for wintering the ewe hoggets or weaner cattle. Such crops are proving of real value in the back country areas of northern Hawke's Bay. A recommended system is to break up land in summer for a winter turnip crop and follow this by a second turnip crop sown in spring for summer fattening before grassing the following autumn.

Turnips on Wairoa and Nuhaka Flats

Some encouraging results have been obtained from white-fleshed turnips for lamb fattening on heavy silt and clay country about Wairoa. Several crops grown in the recent drought season did not appreciably suffer and netted the growers quite substantial profits. Two such crops can be quoted as an example. Both areas had to be swamp ploughed at contract prices at £5 and £8 per acre respectively, and the crops each cost approximately £10 and £11 10s. per acre to establish. The first, a crop of Red Globe, fattened some 32 lambs per acre in mixed drafts from the end of December until early in March, netting approximately 12s. per head, amounting to £19 per acre, which more than offset the cost of the turnip crop.

The second area of Green Globe fattened 24 lambs to the acre, returning a final profit of about £11 10s. per acre.

It is evident that turnips will find a place as a supplementary fodder over a greater part of the county, and it can be recommended as a fattening crop in all areas, except on the Mahia Peninsula and at the mouth of the Mohaka River, where the season is usually reliable enough for ripening rape.

Further Experimental Work

Experiments will be continued in future years, particularly with brassica crosses and selections to ascertain whether the fattening value of the white-fleshed turnip top can be improved.

There is every indication that 1000 to 1500 acres could be sown to turnips for lamb fattening in the district each year. Not only will this materially assist the freezing works over a difficult period but in the long run will lead to more permanent pasture capable of carrying several times the stock numbers that are now carried. These areas, together with the substantial hill country improvement now taking place, should provide the extra stock needed to put the works on a sound footing.

Acknowledgments

The author is specially indebted to Mr. W. Wilson, field officer for Swift N.Z. Co. Ltd., Wairoa, for his assistance in the preparation of this article. In particular, his organisation and management of the trial work at the Raupunga farm, together with the co-operation of the manager, Mr. A. Logan, and farm staff, has made the work possible.

Care of Livestock during October

Contributed by the Animal Research Division

BLOWFLY STRIKE IN EWES

IN districts where crutch strike causes trouble in ewes crutching or early shearing is advised. Close supervision is necessary to detect cases so that suitable treatment can be applied before the strike becomes too extensive. When treating cases of fly strike, shear the soiled wool away from the immediate vicinity of the strike. Dressings containing aldrin, dieldrin, or BHC will rapidly kill the maggots, which will be expelled from the wound. In addition treatment with either aldrin or dieldrin preparations will prevent re-strike until dipping if this is done in January. These dressings do not prevent the flies blowing the sheep with eggs, but they do prevent the maggots from hatching and causing a strike.

Irritant fluids such as kerosene should not be used; they may kill the maggots, but they will irritate the wound and tend to cause re-strike.

Jetting ewes is not usually necessary, but if fly strike is severe, it may be advisable to treat them to give protection until dipping. Apply ¼ gallon of aldrin or dieldrin wash to the crutch of each animal, extending the wetted area to above and round the tail. A pump working at 40lb. to 60lb. pressure per square inch, with a hand cut-out on the nozzle, is advisable for this purpose. Jetting with aldrin or dieldrin at 0.05 per cent. strength will give 2 months' complete protection against crutch strike; for longer protection 0.1 per cent. should be used.

CATTLE TICK CONTROL

Where cattle ticks are plentiful spraying or dipping should be done in November and December to prevent tick worry and to kill the adult female ticks before they lay their eggs.

BLACK DISEASE VACCINATION

In the east coast areas of the North Island, where black disease of sheep occurs, vaccination should be done during November or early December. This will protect against the disease, which occurs mainly in summer and autumn. Vaccine should be ordered immediately.

BLOOD POISONING AFTER SHEARING

Deaths in sheep after shearing may be due to infection of cuts or bruises with the blackleg germ. This disease can be prevented by vaccinating at least 3 weeks before shearing. Sheep which have been vaccinated previously may not require revaccination, and a veterinarian or Livestock Instructor should be consulted about the best procedure.

BLACKHEAD IN POULTRY

Blackhead disease affects young turkeys and poultry and it can best be prevented by rearing these on land which has not been contaminated by adult poultry. If an outbreak occurs, kill all affected birds and move the remainder to clean ground. In the event of a bad outbreak the local Poultry Instructor should be consulted, as in some cases treatment may prove beneficial.

MATING OF DAIRY COWS

Before each cow is mated two heat periods or an interval of at least 30 days should be allowed after calving. Cows mated before this period are less likely to get in calf, and the chances of contaminating the bull are increased. Hand-mating should be practised and accurate records kept showing the bull used and the dates of all services. Should breeding trouble occur these records will be of considerable assistance in arriving at a correct diagnosis.

ROUNDWORMS IN POULTRY

Infestation by roundworms is one of the most important causes of poor development of young birds. All growing stock should be treated twice with carbon tetrachloride, once at 3 months old and again at 5 months old.

SUPPLEMENTARY FEED

Supplementary feed is essential to ensure the proper feeding of cows in winter and in dry summers and to control facial eczema in autumn. As soon as more pasture is available than is necessary to meet the immediate needs of stock the balance should be shut up for silage or hay. On a well-managed dairy farm it should be possible to shut up at least 40 per cent. of the pasture.

Crop growing for fattening of weaned lambs is standard practice in South Island districts and it could with advantage be adopted more widely in North Island districts which experience a dry summer. Crops such as thousand-headed kale, chou moellier, and turnips, in addition to providing excellent fattening feed for lambs, are a splendid insurance against facial eczema. In Poverty Bay and Hawke's Bay they should be sown before the end of October so that they can be well established before dry weather sets in.

GREENLEG IN BROODER CHICKENS

Greenleg occurs in poorly ventilated brooders, especially if they are overcrowded and damp. At the first sign of trouble ensure that ventilation is adequate and that the litter is changed if it is at all damp.

COCCIDIOSIS IN CALVES

Scouring in calves under 6 months of age is seldom due to worms; it is much more likely to be caused by coccidiosis, especially if blood is present in the droppings. Effective drugs are available for treatment, but these can be obtained only on the prescription of a veterinary surgeon, who should be consulted.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during July and for the 12 months ended 31 July 1956, with comparative figures for the same month and 12 months of 1954-55, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage Inc. or dec.
July 1956	2,308	6	2,314	—
July 1955	1,471	2	1,473	—
Increase or decrease ..	+837	+4	+841	+57.094
12 months ended 31/7/56	162,189	2,961	165,150	—
12 months ended 31/7/55	148,538	2,993	151,531	—
Increase or decrease ..	+13,651	—32	+13,619	+8.987

Butter in store at 31 July 1956 was 13,784 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage Inc. or dec.
July 1956	32	—	32	—
July 1955	5	2	7	—
Increase or decrease ..	+27	—2	+25	+357.142
12 months ended 31/7/56	79,428	12,702	92,130	—
12 months ended 31/7/55	77,314	20,558	97,872	—
Increase or decrease ..	+2,114	—7,856	—5,742	—5.867

Cheese in store at 31 July 1956 was 16,150 tons

If these figures are converted into butterfat equivalent, there is an increase of 5.639 per cent. in butterfat graded for the 12 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Fodder Crop and Potato Varieties

Seasonal Notes by the Extension Division

ON many farms in New Zealand brassicas are the main crop for supplementary feed: Rape, kale, or white-fleshed turnips for summer feed, and turnips, swedes, or chou moellier for winter. For successful crops it is important that suitable varieties of seed are sown. The following notes may be of assistance in deciding which varieties to use.

RAPE AND KALE

THREE varieties of rape are available: Broad Leaf Essex for general purposes, Giant for large bulk for first feeding with little recovery, and Club Root Resistant where club root infection is likely to occur. Giant chou moellier is usually preferred for cattle or for carting out and Medium-stemmed for sheep feed. Thousand-headed kale is very suitable on the poorer soils for sheep feed. Thousand-headed kale is very suitable on the poorer soils for sheep feed in either autumn or winter.

SWEDES AND TURNIPS

The range of swede varieties includes the early maturing N.Z. Superlative, the main-crop N.Z. Grand Master and N.Z. Crimson King, with N.Z. Sensation and N.Z. Calder where dry weather and aphis attack are likely to occur, and N.Z. Wilhelmsburger for late feeding. Turnips offer a wide range of types suitable for a variety of soils and climates. The white-fleshed turnips N.Z. Purple Globe, N.Z. Red Globe, N.Z. Green Globe, and N.Z. York Globe are quick maturing and are successful on the lighter soil types. York Globe is particularly early and can be used for late sowings, and N.Z. Green Globe is very versatile and has quite good keeping qualities. Soft yellow-fleshed varieties, N.Z. Champion Hybrid, N.Z. Victory Yellow, and N.Z. Waites Eclipse are suitable for medium to good land. Hard yellow-fleshed types such as N.Z. Purple Top Yellow and N.Z. Greentop Yellow are best suited to good land and cool conditions. They are good keepers. N.Z. Purple Resistant and N.Z. Green Resistant belong to this group and have been selected for their resistance to club root.

—N. L. SHILLITO

* * *

POTATOES

WITH the continued breeding, selection, and introduction of new varieties of potatoes it is now possible to obtain suitable varieties for most soil types. However, of the 24 varieties grown in New Zealand under certification, only about half are grown extensively for commercial purposes. Of the remainder, many are used by the home gardener or by the early grower in favoured localities. Of the main-crop varieties, Aucklander Short Top, though only a moderate yielder, is still the most popular because of its quality and adaptability on most soils. The Dakota has a place in the medium and light soils of Canterbury. It is a heavy producer and a splendid keeper and cooking variety. On account of the wastage with this variety owing to its shape, it is unpopular with the housewife. On the heavy soils, especially in the cooler southern climates, Arran Chief is the most suitable main-crop variety and King Edward and Jersey Bennes are the most suitable as an early main crop and first early crop respectively. Arran Banner is an early-crop variety which crops well on the medium and lighter soils, but unfortunately it is often grown on heavy soils where it produces good crops of poor tubers. The tubers of this variety form early and bulk up quickly and because of this it has found a place with growers producing for the early market. Two other early main-crop varieties, Chippewa and Katahdin, are largely replacing Arran Banner, but these prefer sheltered conditions. They are medium croppers of good table potatoes. Of the more recent introductions, Glen Ilam, Ilam Hardy, and Sebago are varieties growing in popularity. When grown on the better soils they give heavy yields of good tubers. Epicure and Cliff's Kidney are the two main first early varieties. Epicure can be grown on most soils, giving a medium crop of good tubers, but Cliff's Kidney should be grown only on the heaviest soils.

—R. G. JOLLY

* * *

FODDER BEET

FODDER beet is showing considerable promise for pig feeding. This plant has been developed in Scandinavian countries from a cross between sugar beet and mangel. Its dry matter content, intermediate between that of its parents, makes it more suitable than mangels for pig feeding, and it is much easier to lift than true sugar beet.

A wide range of varieties varying appreciably in dry matter content has been produced overseas. Of those tried out in New Zealand, Pajbjerg Rex, with its relatively high dry matter content and ease of harvesting, is preferred for pig feeding. Other varieties (Korsroe, Red Otofte, and Yellow Daeno) are rather lower in dry matter content, but are generally easier to harvest than Pajbjerg Rex.

Fodder beet is ideal for fattening late-summer litters, wintering stores, and fattening spring pigs. Normally crops are hand pulled and fed direct to the pigs, but break feeding with the electric fence has been successful at the Department of Agriculture's Ruakura Animal Research Station. Slicing is desirable when the roots are fed to small pigs. Under some conditions the tops may cause scouring. If this happens, the roots should be pulled and wilted the day before feeding out.

Departmental trials at the Department of Agriculture's Flock House Farm of Instruction, Bulls, have shown that fodder beet can provide up to two-thirds of the diet for pigs being fattened for pork or bacon, and at 120lb. liveweight the pigs will consume up to 20lb. of beet daily. Ideally, beet should be fed with meal and some skimmed milk for finishing; 1lb. of meal and 1 gallon of skimmed milk daily have proved economic.

—D. MERRY

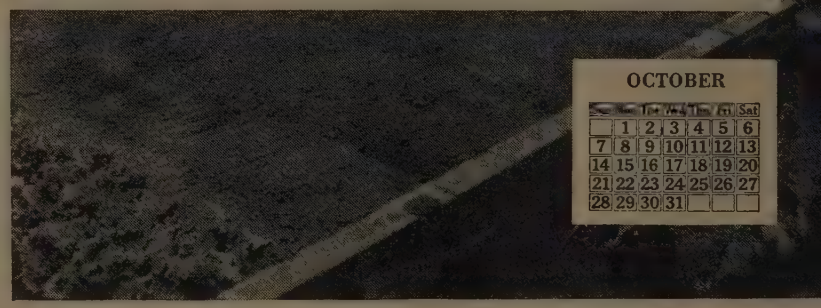
* * *

CONTROL OF CALIFORNIAN THISTLE

CALIFORNIAN thistle if unchecked can become a serious problem both in pastures and crops. In pastures large areas of thistle take up much grazing land and in crops the yield can be greatly reduced. With heavy infestations in either pastures or crops the most satisfactory method of control is with hormones. Because of the thistle's strong underground root system cultivation can be a protracted task with a limited chance of complete success. Better control is obtained from the salts and amines of MCP than from the equivalent 2,4-D compounds. Areas with strongly established thistles require more than one application and should be sprayed with 1lb. acid equivalent per acre of MCP at flower set. If the weed is mown and treated in autumn at the rosette stage, 1lb. acid equivalent per acre of MCP salts gives effective control. Where the pasture is run out best control is obtained by ploughing and discing and then sowing a resistant crop such as potatoes or a cereal. Thistles appearing in the crop can then be sprayed with 1lb. acid equivalent of MCP. Since the cultivation will break up the roots and stimulate growth, all the young thistles will not be killed. These, however, can be effectively controlled in the young pasture by MCP.

—B. A. SMITH

Work in the Home Garden



IN most districts October is the preferred month for main-crop sowing of hardy vegetables. Early sown crops should be well established and should be kept weed free; some early crops may need thinning and where thinning is necessary, it is best done before the seedlings become crowded. In districts where frost danger is past, or can be guarded against, frost-tender subjects such as dwarf and runner beans, cucumbers, marrows, squash, pumpkins, and sweet corn can be sown and tomatoes set out. But in most districts the sowing and planting of frost-tender vegetables are best deferred until toward the end of the month or where killing frost is still likely then, as in most of the plains areas of Canterbury and in some southern areas, until the first or second week in November. Home gardeners who raise their own autumn and winter cabbages and cauliflowers or broccoli should sow during the month or in most districts not later than early November to have sturdy, well-grown plants for setting out in December-January. In this article A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin, discusses work in the vegetable garden in October.

FROST-TENDER vegetables such as tomatoes, dwarf and runner beans, pumpkins, marrows, squash, and sweet corn can be sown or set out if they have been raised in boxes or frames. Young seedlings can be hardened off gradually where conditions are still too severe to permit them to be established in the open by progressively increased exposure to outside conditions. Land to receive them can where necessary be prepared by cultivation, manuring, and the erection of shelter, stakes, or supporting wires.

Asparagus

In most districts asparagus shoots appear above the ground a little after the time of the last killing frost, though occasionally a severe late frost will damage the early shoots. The period of cutting should not be more than about 2 weeks on newly established beds in their third year from the time of sowing the seed (the second year after planting out). In the fourth year the cutting period should not exceed about half the season or about 4 weeks. Thereafter cutting can continue each year for from about 6 to 10 weeks according to seasonal growth and vigour of the bed.

Chinese Cabbage

Chinese cabbage usually does well in the relatively cool conditions of spring, and where conditions are not likely to be too hot or dry a sowing can still be made.

Chinese cabbage somewhat resembles cos or romaine lettuce, but the size of its oval, elongated head is nearer that of Swiss chard. It is sometimes called lettuce cabbage, as the texture of its leaves is more like that of lettuce than that of ordinary cabbage. It is tender and quick growing and the commoner varieties mature in good conditions in about 70 to 90 days. It should be treated like lettuce, but as it grows much bigger, it needs wider spacing. It is also known as celery cabbage because of its flavour and because some of the forms somewhat resemble celery in appearance.

Sowing Seed

Seed should be sown in a prepared seed-bed and the plants set out in the same way as cabbage or lettuce plants, or it can be sown in its final position in rows in good soil and the young plants later thinned. Spring or autumn sowing is preferred in many districts, because if the weather is very hot and dry, growth is slow and consequently the plants may fail to head properly, developing seed stalks instead.

Under favourable conditions Chinese cabbage stores quite well after cutting and may be eaten either cooked or raw. The inside, blanched leaves and heavy but tender midribs have a delicate celery-lettuce flavour which makes it useful in salads. Seed should be sown ½in. deep in rows 18in. apart in a moist, well-drained soil that is very rich in humus. Manurial needs are similar to those of ordinary cabbage. Plants should be thinned when they are 3in. or 4in. high or transplanted 12in. apart in the rows.

Varieties

Varieties include Wong Bok (Pao Ting), which is a short, quick-growing variety 9in. to 11in. high and up to 6in. in diameter. Pe Tsai is a taller and thinner variety than Wong Bok with looser leaves. It withstands dry condi-

tions slightly better, but its flavour is usually considered not as good as that of the others. Chihli is a tall variety 15in. to 20in. high with a base diameter of about 3½in.

Dwarf and Runner Beans

In the North Island and in South Island districts not subject to late frost an early sowing of either dwarf or climbing beans can be made from about mid-October according to the district. Whether runner, climbing (pole), or dwarf beans are grown usually depends on the space available. Climbing beans, if well grown, yield more heavily than dwarf, and the stringless climbing varieties are not inferior in flavour and quality to the best dwarf varieties. Runner beans of the Scarlet Runner type are perennials and do not need to be resown every year. Climbing (pole) beans and dwarf beans are annuals.

Soil Preparation

The soil should be well drained and cultivated before sowing, and though it need not be more than moderately rich in organic material and nitrogen and potash, the addition of phosphates or complete fertilisers rich in phosphates has been found beneficial on many soils where trials have been carried out. Beans are tolerant of moderately acid conditions, but lime should be applied at 2oz. to 3oz. a square yard some time before sowing if the land has not been dressed with lime recently.

Climbing beans can be grown in rows without staking by slashing or pinching back excessively long growths, but where growing conditions are favourable best results are obtained if vines are staked or allowed to climb a support. With dwarf and climbing beans more than one sowing will be needed to ensure continuity of supply. Runner beans crop over a longer period than climbing or dwarf types.

Good paths make gardening more pleasant and assist in preserving neatness.

← Clear labelling is important when seed germination is slow.

Dwarf beans have the advantage of developing pods earlier, taking about 7 to 9 weeks, compared with about 9 to 10 weeks for most climbing varieties.

Sowing

Bean seed should be sown 1in. to 2in. deep, but in exposed positions or on soils that tend to dry out a drill 2in. to 3in. deep should first be drawn out and the seed pressed 1in. to 2in. deep (according to whether the soil is heavy or light) in the bottom of it. Dwarf beans can be sown in single

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rows or double rows 6in. apart with 2ft. between the rows. Seed should be sown or seedlings thinned to 2in. to 4in. apart; the richer the soil is the greater the distance between plants should be.

Runner or climbing beans are usually sown or thinned to 6in. to 8in. apart in double rows about 9in. apart and 3ft. to 4ft. from other vegetables.

Butter or waxpod beans are stringless varieties of french beans with pale or golden pods. There are tall and dwarf varieties. Butter beans should be planted a little later than ordinary french beans. Good varieties include Pencil Podded Wax and Round Pod Kidney Wax (round-podded varieties) and Woods Centenary (butter) and Sure-crop Black Wax (flat podded).

Varieties

Good dwarf varieties of beans include the following:—

Black Valentine, which is heavy bearing with dark green stringless pods about 7in. long. It is often used for a second early or main crop.

Masterpiece crops well with straight, stringless pods; for early main crop or a late sowing.

Tendergreen, which crops well and has tender, dark green, straight, fleshy, round, 6in. pods.

Good climbing varieties of beans include:—

Fardenlosa (Market Wonder), which is widely grown commercially because it crops heavily with straight, tender, fleshy, stringless beans up to about 10in. long.

Westralia, a useful variety somewhat similar to Fardenlosa in cropping. As it appears to be highly resistant to bean rust, it should be specially valuable in districts, particularly in autumn, where that disease is troublesome.

Other useful varieties of dwarf and climbing beans are listed in most seedsmen's catalogues.

Where the diseases anthracnose and bacterial wilt are troublesome resistant varieties of beans should be chosen. All runner beans are resistant. The Plant Diseases Division of the Department of Scientific and Industrial Research recommends the following dwarfs as being highly resistant: Burnley selection of Canadian Wonder (not ordinary Canadian Wonder) and Pale Dun. Black Prince, Blue Pod, and Woods Centenary (also known as Speckled Butter and Stringless Kidney Wax) are resistant, but to a less extent.

Herbs

A well-planned and well-established herb garden is a source of pleasure to both the experienced cook and the garden lover. A herb garden which forms part of the home vegetable garden is usually dominated by plants grown for flavouring or garnishing, but the attractiveness of a herb garden is likely to be greatly enhanced if plants are also included for medicinal use, for use in beverages, for their scents, for making perfumes, or to attract bees.

A herb section of the vegetable garden, if established in a weed-free situation, should require very little attention, particularly if most of the plants are perennials. Weed control must be rigorous and plants such as mint which tend to encroach on others should either be chopped back regularly or planted where their spread will do no harm. A piece of tin sunk into the ground round them is usually effective. It need not show from above. Some home gardeners use the top of an oil-drum (5, 10, or 40 gallons).

Herbs such as parsley, mint, sage, chives, and thyme should be grown in most good-sized gardens. The culture of parsley and chives was described in last month's "Journal."

[Green and Hahn

Early sowings of runner or climbing beans usually do well against a fence in a sunny position.

Mint is usually propagated by rooted cuttings of the creeping or underground stems. In gardens inclined to be dry it should be planted under or near a water tap. Its tendency to spread where conditions suit it can be overcome by surrounding it with a sheet of tin about 8in. deep.

Sage is usually grown as a perennial and is usually propagated by cuttings chosen from good stock. There are two kinds of common sage: The broad-leafed kind, which flowers little or not at all, is usually preferred, though the narrow-leafed kind is also valuable. Sage grows up to 16in. tall and cuttings should be set out about 18in. apart in a warm situation. It is probably the most commonly used of all herbs for seasoning.

Thyme is of two principal kinds, common and lemon. Both are perennials and are propagated by seed, the breaking up of clumps, or by cuttings. Plants should be set out about 12in. apart on a reasonably dry, well-drained border. Good drainage is important, as thyme readily suffers injury in wet soil. Other interesting kinds of thyme are the silver, orange,

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and golden varieties. In addition, there are several varieties of wild thyme.

Herb Edgings and Herbs for Paths

Though herbs are popular in formal herb gardens, they can be used very effectively as edgings for paths. In addition some prostrate herbs will greatly enhance the attractiveness of paved paths if planted in the interstices of the flagstones. Where traffic is light and reasonable care is taken by weeding and not walking on them in wet weather good paths can be made entirely of herbs such as the prostrate varieties of thyme, mint (*Mentha requieni*), calamint (*Calamintha alpina*), English pennyroyal, and burnet.

Where ground space is limited herbs can also be planted in holes cut in a barrel or steel drum in the same way as is sometimes used for strawberries. If it is desired to move the barrel occasionally, the centre should be filled (to lighten it) with a box made by nailing three or four planks together at the edges or by placing tightly packed straw in the centre.

Mustard Greens

Mustard greens are also called Chinese mustard and mustard spinach. They are tasty, useful, and easily grown forms of greens that deserve to be more widely grown in home gardens. They are not new to the vegetable garden, though the improved strains now available and the modern appreciation of vegetables that are rich in vitamins have made people more aware of them.

There are several kinds of loose-leafed sorts, represented by the broad-leafed varieties such as Florida Broad Leafed and New Chinese, and the curled types, which include varieties such as Southern Giant Curled. The variety Tender Green, which is also known as Mustard Spinach, is a fine one with dark green, rather thick, fairly smooth, spoon-shaped leaves that combines the flavours of mustard and spinach. As it is slow to seed, being more resistant to hot, dry conditions than some of the other varieties, it is a good variety for sowing now. A hearting variety, known as Hearting Chinese Mustard, is also popular. The leaves grow 12in. to 14in. long and the hearts, which are about 8in. wide, blanch well.

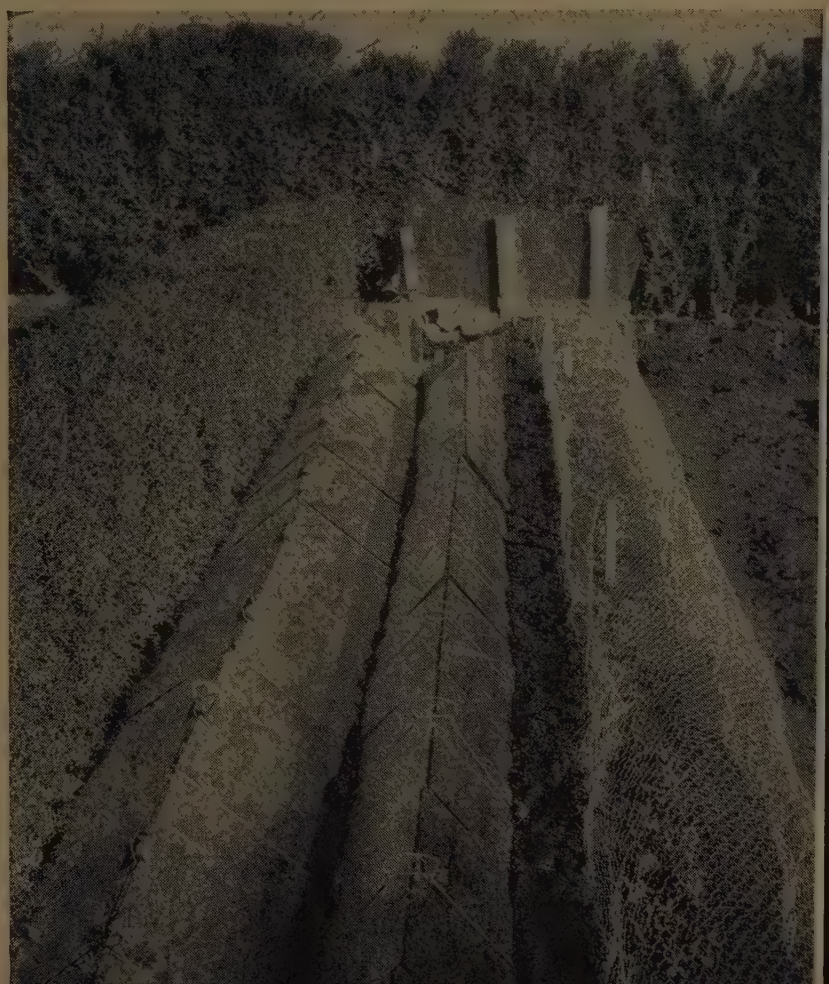
The flavour of all varieties mentioned is mild, and though some varieties will grow fairly well in the poorer soils, for best results it is advisable to grow them in rich, moist soils and in moderately cool conditions. The open varieties, particularly, are an excellent substitute for spinach and should be gathered in the same way, though the leaves are larger than the largest spinach leaves. Thinnings should be pulled first and used with the roots cut off. When the remaining plants are large enough a few of the largest leaves can be taken off them as they develop. They can be removed with the fingers or a pair of scissors and should be used when young and tender; they can be cooked like spinach or used in salads. Mustard greens are a good source of vitamins.

Seed should be sown ¼in. deep in rows 15in. apart. Plants of the open-leafed kind should be thinned to 6in. apart in the rows and of the hearting kind to at least 9in. apart. The crop should be ready for use in from 35 to 45 days from seed sowing. Manurial treatment is similar to that of spinach.

Frost-tender Vegetables

Where killing frosts are unlikely early sowings of cucumbers, pumpkins, squash, marrows, and melons can be made toward the end of the month. The culture and soil requirements of all are similar, though melons need warmer conditions than the others. None of these plants should be sown in the open to be above ground before frost danger is past and the ground must have warmed sufficiently and not be too wet or the seed is liable to rot. The plants thrive in a wide range of soils, from sandy to moderately heavy, provided there is an assured supply of moisture and plenty of organic matter.

Well-drained, light, warm, aerated soils are best for early crops, but for main crops heavier soils usually give a higher yield over a longer period. Organic matter can be increased by digging in a green crop, but, particularly in colder districts, better results are usually obtained if about 1 cub. ft. of soil is removed at 2ft. to 3ft. intervals and the holes, except for the top 3in. or 4in., are filled with manure (preferably with partly rotted, fermenting stable manure). Seed can be sown in soil placed on top or, preferably, at the edge of the manure. Rows should be at least 4ft.



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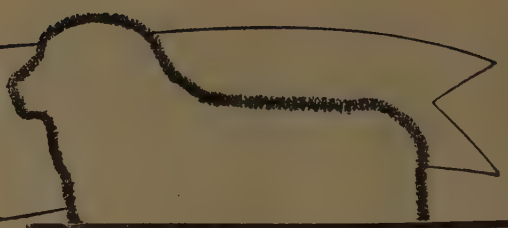

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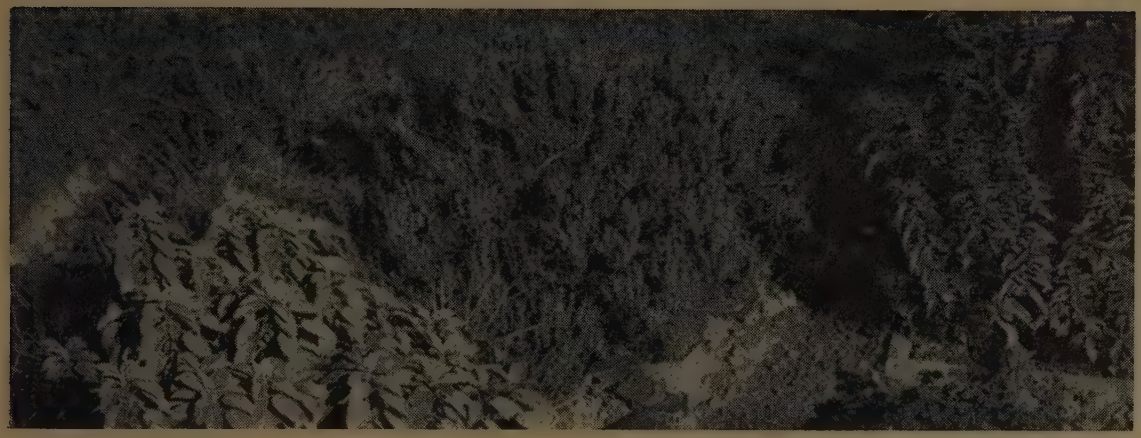

[*Green and Hahn*

▲ Herbs deserve a place in every well-planned garden. They can be used as edgings or can be grown in an area set aside for them.

apart. This is known as the hill system of sowing. The ground should if possible be level after sowing to facilitate watering.

Apart from watering and weed control very little attention should be needed after plants are established. With trailing varieties pinching out of the ends of leaders when they are about 18in. long may be necessary to encourage the development of laterals. Plants can be trained by pegging the runners with sticks.

The fruit of marrows should be cut when young, preferably before the skin hardens to the extent that it cannot be broken easily by the thumbnail; 10in. to 12in. is a good size. As marrows increase in size their flavour usually deteriorates and the seed area increases. In favourable seasons, too, early cutting of the fruit induces more to develop. It is therefore inadvisable to allow fruit to reach full maturity unless very large specimens are wanted or fruit is to be stored for winter.

Sweet Corn

In hardiness sweet corn compares with the tomato and french bean and can be sown outside about the same time as french beans. Sweet corn can be grown in rows, but if it is grown in hills or clumps, pollination is usually assisted. Seed should be sown 1in. to 2in. deep. If seed is planted in rows, the plants should be 12in. apart and the rows 36in. apart. Clumps should be 36in. apart, and though it is usually advisable to sow about 7 or 8 seeds at each clump to allow for failures, only 4 or 5 of the strongest plants should be left after seedlings reach about 2in. high. The number of seeds per ounce varies from about 100 to 230 according to variety.

Sweet corn can be grown on a wide variety of soils, and though crops can be grown on soil of only moderate fertility, best results are obtained on warm, well-manured medium or light loams. Addition of organic material such as farmyard or stable manure is advisable on most home garden soils.

Fertilisers

Extensive research on the manuring of corn indicates that on most soils both quality and yield of cobs are likely to be improved by a fertiliser rich in nitrogen, phosphorus, and potash. A fertiliser likely to suit a wide range of conditions can be made up by mixing either 4 parts by weight of blood and bone and 1 part of sulphate or muriate of potash or 2½ parts each of sulphate of ammonia and superphosphate and 1 part of potash. Either mixture can be applied at 3oz. to 6oz. to a square yard according to the fertility of the soil.

Suckers often develop at the bases of plants, but there is no evidence that their removal promotes earliness or increases the number or weight of the ears on the stems. When the plants are 3ft. to 4ft. high it is usually advisable to earth them up the stems to a height of 6in. to 8in., as this benefits the roots and helps to support plants against wind. In exposed positions staking may also be necessary. A warm, sunny, sheltered position is preferable in most gardens, and soils rich in organic matter should not require watering unless conditions are exceptionally dry.

In most southern districts the crop is likely to be disappointing in cold, wet seasons.

The choice of variety suited to local conditions is very important and much work has been done overseas on the production of varieties suited to specific conditions. Of the varieties available in New Zealand Golden Cross Bantam is very popular. It matures in 90 to 100 days. Marcross matures a little earlier (in about 80 days) and is useful for earlier sowing and in districts with a shorter growing season. Older varieties include Country Gentleman, Golden Bantam, and Stowell's Evergreen.

Kumaras

Kumaras or sweet potatoes are usually propagated by rooted shoots or slips, which can be purchased from seedsmen, usually from about mid-October onward in areas suited to the culture of the plant.

The soil for kumaras should be of a type that warms readily, and light or sandy loams are usually preferred. Organic manure applied to a previous crop gives most satisfactory results and in most soils it should be supplemented with a dressing of bone meal or superphosphate, as trials indicate that kumaras need a good deal of phosphate, though the need for potash seems to depend more on soil type. Very little nitrogen is usually required and an excess promotes top growth at the expense of tubers. As roots are very sensitive to injury, fertiliser should be well worked along the row a week or two before planting.

Planting can be done on the flat, but in districts in New Zealand where there is no danger of soil drying out plants are usually set out on broad, low ridges, which warm quickly and facilitate digging. Care should be taken that the rooted shoots do not dry out between lifting and planting. If necessary, they should be puddled in thick, muddy water.

In the home garden slips should be set out 16in. apart on the flattened tops of low ridges 24in. apart. Plants, which should be set about the same depth as they grew in the propagating bed, are considered to make better tuber development if the rooted portion of each plant is bent up like

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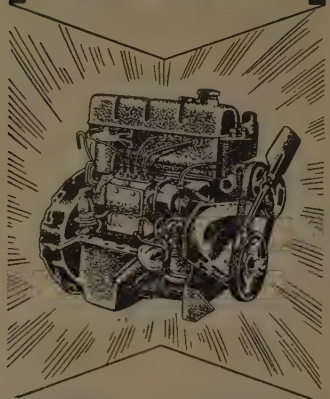

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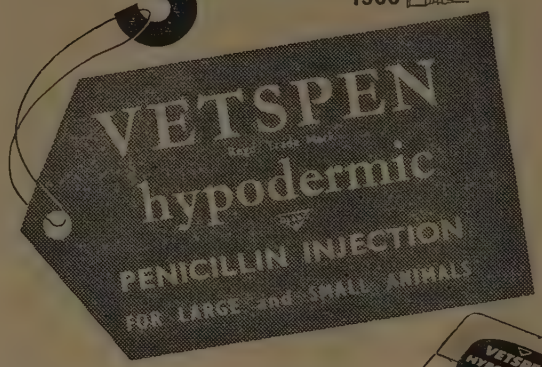

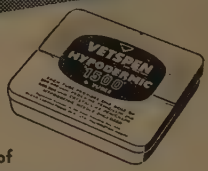

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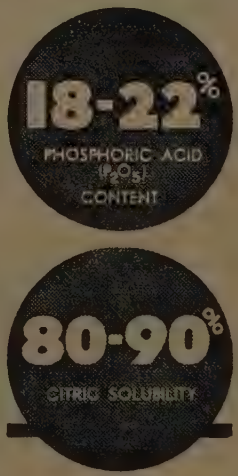

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the bottom end of a J. Plants should be watered when they are set out if conditions are dry. Apart from weed control and the repair of broken ridges, cultivation is unnecessary, though vines are usually lifted occasionally to prevent their rooting, as such rooting appears to favour leaf rather than tuber development.

Tomatoes

Tomato plants are usually set out from about the middle to the end of October according to district and frost incidence, except in parts of Canterbury and some southern districts where there is danger of frost until about the second week in November. Soil preparation should preferably have been carried out some time before planting out. Soil should be deeply dug and should contain plenty of humus and should not have been used recently for tomatoes or potatoes, because of risk of carry-over of disease.

A complete fertiliser can be dug in or it can be scattered in a furrow taken out with a hoe on the line on which the plants are to be set out and the furrow closed by hoeing the soil back over the fertiliser. Staked plants are usually set out 12in. to 15in. apart in the rows with the rows about 3ft. to 4ft. apart. Dwarf varieties may be set out 2ft. by 3ft. apart, but where space permits plants usually are better spaced 3ft. by 3ft. or 3ft. by 4ft.

Where late blight and stem borer or other caterpillars are troublesome it is advisable to apply a fungicide (such as bordeaux or copper oxychloride) together with DDT. The first spray should be applied within about 10 days of planting and it should be repeated every 2 to 4 weeks according to the weather and local severity of late blight and pests, but to avoid health hazards DDT should not be applied to fruit within 3 weeks of harvesting. Fungicide sprays are usually not necessary in the drier districts.

Plants which show any marked deviation from normal growth should be destroyed. Distortion of young leaves or mosaic mottling may indicate infection with virus, different strains of which vary in their effect on tomato plants. Those which develop narrow, often distorted, fern-like leaves or have a stunted appearance usually give little if any crop.

They should be removed and burnt, but great care should be taken not to touch healthy plants without washing the hands after handling infected plants, as most virus diseases are readily transmitted by the hands.

Good dwarf varieties include Stoner's Dwarf Gem.

[*Green and Hahn*

As peas remain in bearing for only a short time, successional sowings of them should be made.

Adelaide Dwarf, Marglobe, and Early Chatham. Popular tall varieties are Kondine, Best of All, Carter's Sunrise, Potentate, Moneymaker, and Stoner's Prolific, though many others are listed in seedsmen's catalogues.

Potatoes

Main-crop potatoes are planted in most districts in October, as by the time the tops emerge the danger of killing frost is usually past. As few vegetables are subject to as many diseases as potatoes and some are carried over in the tubers, seed should be selected as carefully as possible.

The soil for potatoes should be deeply and thoroughly cultivated, as thorough preparation of the soil not only ensures a good seed-bed but helps to maintain satisfactory moisture content, aeration, and temperature. Soils that have been trenched should be given time to settle before planting.

Heavy dressings of organic manure are not advisable just before planting, as they may induce conditions which favour the development of scab. A heavy dressing applied the previous year, so that it is thoroughly decomposed, or a green crop dug in some time before planting will usually help to give satisfactory results, as also will the addition of such material as grass clippings.

Soils which have been heavily limed or heavily dressed with the ashes of the garden bonfire should not be used. The potato is tolerant of acid conditions, and in soils infected with potato scab the organism will be suppressed if the soil is medium to strongly acid. Lime gives the soil an alkaline reaction.

Fertiliser

The fertiliser required for potatoes depends greatly on the amount of organic matter previously incorporated in

[*Sparrow*

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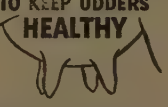

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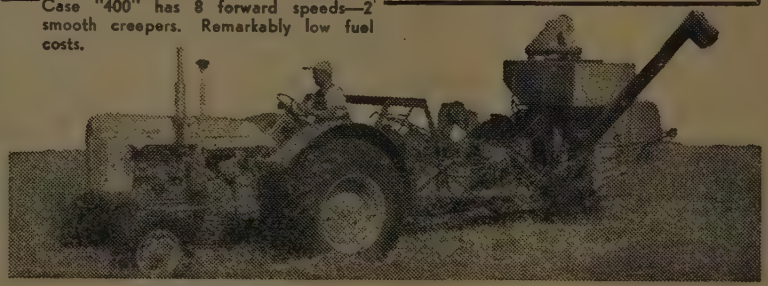

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the soil, but generally Department of Agriculture trials in New Zealand have shown that a mixture (by weight) of 1 part of sulphate of ammonia and, according to soil type, 3 to 5 parts of superphosphate applied at about 1½oz. to 2oz. per yard of row will usually give good results. The addition of muriate of potash or sulphate of potash, preferably the latter, at about ½oz. to a yard of row will give improved results on many soils and is advised for most home garden soils. Instead of superphosphate and sulphate of ammonia equal parts of superphosphate and blood and bone can be used.

The simplest way to plant is usually to open a trench about 4in. to 5in. deep and to dust the fertiliser along it. In the home garden rows are usually 2ft. apart and tubers can be placed from 9in. to 14in. or 16in. apart in the rows. The wider spacings are favoured for main-crop or very large growing varieties. If the tubers are large (4oz. or heavier) they can be cut into two or more sets if desired. Each should be chunky and have at least two eyes and a minimum of cut surface.

Cut surfaces should not be allowed to dry out, but should heal or callus over promptly. The pieces should be planted immediately they are cut in a warm soil that is neither too wet nor too dry. Apart from the use of the best seed available and the use of suitable fertilisers, an important point in potato growing is the choice of a variety suited to the district and the purpose for which the variety is grown (that is, early, second early, or main crop).

Varieties

Different varieties of potatoes are favoured by growers in different districts. Department of Agriculture trials have shown that this district selectiveness on the part of the growers is justified, as yield and other favourable characteristics of some varieties have shown to advantage in certain districts, though the varieties favoured by both home and commercial growers have not always proved the best in the district where they are most popular. In gardens where there is sufficient space a trial of several varieties over several years is well worth while.

There are many varieties, but the following are some which have shown up well in Department of Agriculture trials, though not all of them have shown up well in all districts: Glen Ilam, Arran Banner, Dakota, Ilam Hardy, Inverness Favourite, Arran Chief, and Sebago. Home garden soils are not always as suitable for potatoes as are the soils on which they are grown commercially and for that reason a trial of several varieties is warranted.

[*Sparrow*

In districts where late blight usually attacks potato crops they should be sprayed with a fungicide that is Government certified for control of the disease.

Radishes

Many home gardeners have difficulty in growing good radishes. The soil should be well drained and preferably light and the top 6in. cultivated to a very fine tilth. It should be very rich in fine, well-rotted organic matter such as well-rotted compost. Improved results are usually obtained in most soils by the addition of a complete fertiliser applied at about 1oz. to 1½oz. per square yard. Radish usually succeeds best in soil that is slightly to moderately acid, but a light dressing of lime some time before sowing may give improved results on some soils, particularly in higher-rainfall districts.

Small successional sowings of radishes are usually made as required. Seed should be sown thinly (12 to 15 to 1ft.) ½in. deep in rows which need be only 4in. to 8in. apart. Deeper sowing may result in a large percentage of inferior roots. The soil should be gently firmed after sowing, as the roots do not bulb well in loose soil. Seed can also be sown broadcast, but weeding is more difficult than with seed sown in rows.

The roots should never be allowed to dry out and in summer shelter from the sun is advisable; this is best achieved by sowing radishes in the shade of a taller crop. The food value of radishes is not high, their value lying in their fresh crispness and mild pungency. However, their quality is so greatly impaired by slow growth or checks that in adverse conditions they are likely to be hot, pithy, and indigestible. Several good varieties are available from seedsmen.

Rhubarb

Rhubarb responds to liberal manuring, but production from even the healthiest, well-fed crowns is likely to be affected if heavy harvesting is continued too long. Pulling exhausts the plants, and the ground must be given an adequate period in which to develop the leaves which enable plants to build up stores of food for the following season.

In harvesting, the stalks are grasped near the bases and pulled with a twisting motion so that they break cleanly and cause only a minimum of injury to the crown. The leaves of rhubarb should not be eaten, as they contain a number of poisonous substances.

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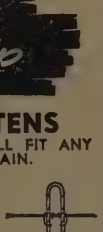

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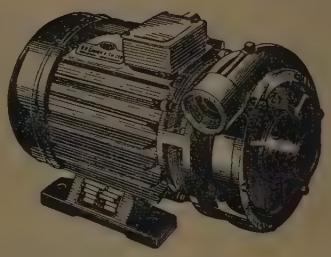

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Simple precautions

1. Always boil raw liver, lungs, etc., before feeding to dogs. Otherwise bury or burn all offal.

2. Dose your dog every three months with Arecoline, the vermifuge supplied with your dog license.

3. After handling animals, never put hand to mouth without washing.

4. Be sure children wash hands before every meal.

5. Wash thoroughly all vegetables and fruit eaten raw.

Your co-operation is necessary . . .

DOSE YOUR DOG REGULARLY

17.2.54

An announcement from the N.Z. Department of Health

Preparation of Hive Equipment for New Season

Seasonal Notes for the Domestic Beekeeper

SPRINGTIME is the beginning of another busy season for bees and beekeepers; personal and hive equipment must be examined and repaired or replaced if the beekeeper is to enter the new season confident in the knowledge that everything is in order and ready for the honey crop. This article by A. W. Bennett, Apiary Instructor, Department of Agriculture, Hamilton, describes the steps necessary to ensure readiness for the season.

IT is good beekeeping practice to see that all colonies are given a quick examination as early in spring as possible. Before this is done a check should be made of all the equipment necessary for the handling of the bees in maximum comfort. Start with the smoker and give it a good clean out. Remove the grid from the inside of the barrel and chip off the sooty deposit from around the air intake. Make sure the bellows are sound and capable of forcing out a good blast of air. Next, examine the bee veil and see how many holes require closing in. Bees seem to have an amazing ability to locate even the smallest openings. The hive tool may require sharpening to expedite the removal of overwintered burr comb. Make sure the overalls will stand up to another season's hard work.

Everything is now in readiness for those first fine days in early spring.

Inspection of Hives

As the first spring inspection has to be carried out as quickly as possible, it is well to understand what has to be done.

1. Clean down and replace floor boards and check the condition of hives and lids.

2. Check for food supply (honey and pollen).

3. Look for brood.

4. Take notice of uncapped cells scattered over the brood combs.

Before opening the hive see that the smoker is well alight, that the veil is properly on and well tucked in or fastened down over the shoulders, and that gauntlets or gloves are in place.

First, give the hive two or three puffs of smoke at the entrance; this will cause the bees to fill themselves with honey and make handling much easier. Remove the roof from the hive and place it upside down on the ground in front of the hive. Take the brood chamber and stand it on the rim of the roof. Now the mess to be cleaned from the floor can be seen; a few puffs of smoke will soon move the bees from this.

Take the hive tool and scrape the floor clean, putting the cleanings into a tin, or better still replace the floor board with a clean floor board, making sure that it sits firmly on its base (four house bricks will do) and is level.

Bring the brood chamber back and place it on the clean floor, give a slight puff of smoke again at the entrance, gently raise the mat (two or three puffs of smoke under this will move the bees off the top bars), then pull the mat back to uncover about five frames. If it is a warm day, the mat can be taken off the hive and placed in the roof.

With the hive tool quickly but gently remove any burr comb projecting above the frames and place it in the tin with the floor cleanings. (This wax salvage is quite profitable.)

Now take the outside frame out of the brood chamber. This will have no brood on and may even be empty of stores. Lean this against the side of the hive and look at the next frame. If it is in good condition, replace it in the brood chamber in the position of the frame taken out and so on until all frames have been inspected. Clean any burr comb from the sides of the frames. Replace the first comb taken out in the space left on the far side of the brood chamber, cover it over with the mat, and replace the roof.

During the examination the beekeeper should have noticed if there is still plenty of capped honey. If none is evident, the hive should either be given another two frames of honey which have been stored for this purpose, or the food supply should be supplemented by feeding sugar. It should also be noticed if pollen is present in some of the combs.

If a small patch of brood is noticed and eggs can also be seen in the cells, it can be assumed that the queen is present and just beginning to build up the colony strength of the hive. If no brood of any sort is showing, it is quite possible that the queen is present but has not begun to lay. A further inspection should be made of the hive in a week or two. Should only drone brood be present, the queen has become a drone layer or laying workers have taken over. In either case the colony may have so dwindled that it would not be worth while uniting it to a normal colony.

If there are capped cells on any of the brood combs that have not hatched out, be suspicious and check for disease. The local Apiary Instructor can give instructions on this matter.

Prepare Equipment in Advance

THE successful beekeeper will have his equipment ready for use when it is wanted. He should inspect stocks of frames, foundation, and supers, and if more will be required during the season, he should order them or make them now, and not wait until they are wanted, as this will mean delay, and a few days' delay may mean the loss of a super of honey or a good hive swarmed.

A useful feeder can be made by punching a few small nail holes in the lid of a 5lb. honey tin. When it is full the tin is stood upside down over a hole cut in the mat for this purpose. An empty super is then placed round this and the roof put on. Care should be taken not to spill the syrup in the apiary or on the mat, as this will excite the bees and often cause them to rob.

Artificial Feeding

If artificial feeding is necessary, a mixture of equal parts of sugar and water is suitable at this time of the year. This should be given about twice a week until the bees are able to maintain themselves from natural sources.

Feed luke-warm syrup late in the day and give no more than the bees are able to take up during the night.

Control of Brassica Seed Crop Aphides

By A. D. LOWE,
Entomological Research Station, Department of Scientific and Industrial Research, Ashburton

GROWERS of seed crops of brassicas have long been troubled by aphides. The feeding of these insects, which form huge colonies on the developing seed head in spring, cuts off the supply of sap to the seed pods, resulting in poor set of seed.

SOME indication of the effect of aphides on seed yield is given in the table below. Seed pods were examined after being collected from three conditions of plants—free from insects, lightly infested, and heavily infested—from the same field of kale.

Other counts of seed pods per plant taken by a random system on 96 plants in the same field showed that those treated with lindane against aphides bore an average of 23 pods, but untreated plants yielded only 7 pods per plant. As the table shows, pods on infested plants yielded much less seed per pod, so that the total effect of aphides on individual plants and on seed yield is considerable.

Aphides which Infest Brassicas

Three aphides have been recorded as infesting brassica plants in New Zealand — *Myzus persicae* (Sulz.), *Lipaphis erysimi* (Kltb.), and the cabbage aphis *Brevicoryne brassicae* (L.). Though *Lipaphis erysimi* has been observed infesting a seed crop, the cabbage aphis is usually responsible for such infestations. Most brassica seed crops are grown in the drier areas of Canterbury and Central Otago, and under drought conditions infestations of cabbage aphides are particularly severe.

Though some natural control of aphis populations is always occurring under field conditions, such control is negligible in spring. Observation shows that ladybirds play a very small part at this time of the year, and counts of parasites have shown that in spring they control less than 1 per cent. of the total population.

Because of this lack of effective natural control growers have turned to the newer insecticides as a means of combating this pest. The value of the crop, if it could be made to give its full seed yield, is such that it could bear quite a considerable expense if control of the insects was certain. The question of treatment cannot be considered, however, without a realisation that spring infestations are closely associated with the flowering period.

Advantages of Autumn Treatment

Contrary to popular opinion, spring aphis colonies develop on those plants on which the insects have spent the winter. They are not the result of spring flights, as is shown by the fact that as late as mid-October less than 1 per cent. of the population is winged. They are derived from a residue of the autumn population which has multiplied rapidly with the onset of spring.

Growers should therefore give consideration to preventive treatment by spraying or dusting in autumn while plants are still quite small. Machinery can then be taken through the crop, and such treatment would prevent any build-up of the insects. Repeat treatments are worth while to ensure that the crop enters the winter free of aphides.

If this opportunity is missed, the spring period available for treatment is very brief. Under conditions in Canterbury, where many of these crops are grown, spring growth begins about mid-August and by mid-September flower heads are beginning to show colour. It is then too late to consider treatment without creating a hazard to bees. There are very few nectar-bearing plants in these areas at this time of the year, the bees depending almost entirely on seed crops for their honey source.

In the absence of other flowers only a few brassica blooms need be available for bees to be attracted to such crops in large numbers. The use of insecticides at such a time is obviously against the farmer's own interests. Spring treatment of such crops therefore calls for extreme care in the timing of applications.

EXAMINATION OF 50 PODS FROM EACH OF THREE TYPES OF PLANTS

Plant	Percentage of pods bearing seed		Actual seeds yielded	
	Good	Pinched	Good	Pinched
Heavily infested ..	0	20	0	41
Lightly infested ..	78	80	295	148
Free of aphides ..	94	90	751	246

Materials and Methods

Several insecticides are being offered for aphis control in New Zealand, but present recommendations are limited to the use of lindane to control the cabbage aphis. This material should be used at the rate of ½lb. to 1lb. of active ingredient per acre. Where this is applied by ground machinery as a spray 20 gallons of water per acre are necessary for reasonable coverage of leafy crops. If blockages are to be avoided, only emulsions or colloidal preparations should be used.

Owing to the height of the crops in spring aerial treatment is much more likely to be used then. For this purpose suitable lindane dusts are available from commercial sources. If application is by spraying, as much water as possible should be used and certainly not less than 10 gallons per acre. Emulsion is the only form of lindane suitable for aerial spraying.

For information about usage of other insecticides offered for this type of work, especially if it is stated that they are non-toxic to bees, growers should consult their local Instructors in Agriculture.

Weedkillers Should not be Stored Near Seed

MANY weedkillers are volatile; they have the property of passing off fumes that are toxic to susceptible plants. Trial work has shown that if volatile weedkillers are stored near seed, sufficient toxic material escapes to reduce significantly the germination of seed. This is particularly likely to occur if volatile weedkillers are stored in a small shed in association with seed for a prolonged period.

The most dangerous preparations are the ethyl and butyl esters of 2,4-D and 2,4,5-T and the carbamates IPC and CIPC. These preparations have even been known to affect the germination of susceptible crops, such as brassicas, by being stored close to the fertiliser that was sown with the crop.

Volatile weedkillers should be stored separately to minimise contamination of seed, fertiliser, and even agricultural equipment.

—*L. J. MATTHEWS,*
Weeds Research Officer,
Department of Agriculture,
Wellington

Trials Suggest that

Rape and Borre Lupin Mixtures Fatten Lambs Better than Rape Alone

By A. F. GREENALL, Crop Research Division,
Department of Scientific and Industrial Research, Lincoln

A mixture of Broad Leaf Essex rape and Borre sweet blue lupin has yielded on the average 30 per cent. more dry matter per acre than rape at the Crop Research Division, Department of Scientific and Industrial Research, Lincoln, during the last 3 years. The mixture, which appeared very palatable to lambs, has induced better daily liveweight gains than has rape. The dry matter yields of the mixture have been consistently higher than have those of rape, which has given low yields, particularly in dry seasons. The mixture suppressed weeds better than rape, which was also more severely damaged by insect pests. Whereas rape has shown wide variability in maturity time, the mixture has been more predictable in this respect.

THE Extension Division of the Department of Agriculture is carrying out further trials to test the mixture in other districts, and until these are complete the general usefulness and range of the mixture will not be fully known. However, results at the Crop Research Division have been sufficiently promising to warrant publication of this information, particularly as Certified Borre lupin seed is being multiplied now for future release to farmers, if these further trials give satisfactory results.

Performance at Lincoln can only be a general guide to the wider use of this mixture; consequently precise information on its use for particular soils and climatic conditions must await the completion of the Department of Agriculture trials.

The Crop Research Division's series of trials with Borre lupin-rape mixtures began in 1952. The decision to use a mixture of rape—the main lamb fattening crop—and a legume arose from the knowledge that crop yields are often increased by the inclusion of a legume in a mixture, that many legumes are productive nitrogen fixers, and that two or more suitable species of plant when grown together more fully use available soil resources. It was also recognised that mixed forages may provide a more balanced and acceptable diet for grazing animals.

Lupin was selected as the most suitable legume, since trials by Canterbury Agricultural College, R. M. Allison and W. G. Thurston, and T. K. Ewer and D. P. Sinclair had indicated its value. Borre lupin was selected as the most suitable variety on the basis of trials by R. F. M. Van Steveninck and F. Allen at the Crop Research Division.

They have shown that this variety possesses more desirable characters such as uniform emergence due to absence of hard seeds, rapid early growth, earlier maturity, and better forage and seed yield than the sweet blue lupin varieties previously used.

Trial Methods

A series of seven trials of the rape-lupin mixture has been carried out from 1946 to 1955. In two trials in 1946 Allison and Thurston used New Zealand Sweet Blue lupin and measured dry matter yield and digestibility. Results are shown in Table 1 under A and B. Borre lupin was used in the remaining trials.

Trial D (Table 1) was grazed with 2-tooth wethers, and measurements of total dry matter production, stubble wastage, grazing wastage, dry matter consumption, and digestibility were made. The dung excreted by the sheep on this trial was collected and weighed and from this and the feed to dung ratio, obtained from a separate digestibility trial, the amount of feed eaten was calculated.

Trial G was a block grazing trial conducted at Ashley Dene, the Canterbury Agricultural College's light land farm, in co-operation with Professor I. E. Coop and V. R. Clark. Twenty weighed lambs were grazed for 28 days on each 1½-acre block of Borre lupin, Broad Leaf Essex rape, and a 1:1 plant mixture of the two. Dry matter yields and daily liveweight gains were measured.

A digestibility trial of Borre lupin, Broad Leaf Essex rape, and the mixture was carried out in 1956 by M. J. Crampton (Crop Research Division), who has kindly permitted the use of the results.

Sheep feeding on Broad Leaf Essex rape, Borre lupin, and a mixture of rape and lupin in a digestibility trial.

Establishment

In most of the trials the lupin was sown through the grain box, and the rape was sown with a 2:1 mixture of superphosphate and lime. Seed was drilled deeper than is usual for rape and shallower than is normal for lupins. Seed rates were designed to give the same number of plants in each treatment and 50 per cent. rape with 50 per cent. lupin in the mixture.

It was found that 80 per cent. of the viable lupin seed grew into plants whatever the season and whether in a mixture or not. However, only about 60 per cent. of the viable rape seeds produced plants. This percentage varied from trial to trial and was sometimes higher in the mixtures than when lupin and rape were sown alone. For instance, in the wet spring of 1952 the emergence of rape was 39 per cent. in pure sowings and 67 per cent. in the mixture with lupins. This was thought to be due to the robust lupin seedlings breaking the surface crust and permitting the delicate rape seedlings to emerge.

Competition with Weeds

With the exception of the Ashley Dene trial Borre lupin has grown either as well as or better than rape in the mixture. Borre lupin in pure sowings has sometimes been affected more than rape by weed competition,

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but the mixture has always been at least as good as rape in competing with weeds.

Birds find Borre seedlings particularly attractive during early establishment, and large numbers concentrating on small plots have frequently delayed early growth. The severity of damage to small plots by birds, hares, and rabbits would probably not be experienced on a paddock scale.

Composition of the Mixture

Except in the wet spring of 1952 and in the Ashley Dene trial the lupin plants have produced more dry matter than the rape plants. The lupin is probably able to grow better than rape in dry seasons. This is to be expected from its deep rooting system and its relative independence of soil nitrogen.

The poor growth of the lupin in the Ashley Dene trial is thought to be due partly to poor nodulation. Rapid and adequate nodulation seems essential to the growth of lupin, particularly in mixtures with non-leguminous plants, with which they, in common with many legumes, are poor competitors for soil nitrogen.

The conditions which favour dominance of rape in the mixture appear to be high levels of soil moisture and of plant nutrients, particularly nitrogen. Seasons favouring rapid early rape growth followed by premature ripening before the period of maximum lupin growth also seem to produce rape dominance. On the other hand it is probable that lupin does better than rape in the mixture in dry seasons, in soils lower in nitrogen, or when adverse conditions for rape are followed by good conditions for lupin. However, if available soil nitrogen is too low, the early growth and nodulation of the lupin may also be retarded.

Yields

Rape is the standard lamb fattening crop in present farm use. As the mixture is being compared with rape, the most apt comparison will be the liveweight-producing capacities of the two crops. Because of the large area and the large number of lambs necessary for liveweight gain trials, only one of this kind has been possible. However, a good appreciation of the liveweight-producing capacities of equal areas of two or more crops can be obtained from the measurement of the factors which are known to determine liveweight gain. For fattening, it is the level of daily intake of feed units, together with the lamb days per unit area, which determines the liveweight-producing capacity of the area.

The daily intake of feed units depends on the weight of dry matter eaten daily, its chemical composition, and the amount of each constituent digested. The amount of dry matter eaten per day is also known to be governed by the dry matter percentage of the feed together with its palatability. The lamb-days for an area of course depend on the yield and the amount eaten per day. Less feed is eaten than is grown, as there is always a considerable amount wasted. It is probable that the proportion wasted is greater in some crops than in others. All these factors have been measured in trials and the results are presented in the three tables.

The dry matter yields per acre of all trials in which rape and Borre lupin have been grown are shown in Table 1. Allison's and Thurston's results with New Zealand Sweet Blue lupin, rape, and a mixture of the two are also included, as in that year the growth of the New Zealand Sweet Blue lupin was similar to that of Borre lupin except for maturity, which was later.

In all trials the mixture has outyielded rape by an average of 34 per cent. or by 29 per cent. in those trials using Borre lupin. Furthermore Borre lupin by itself has outyielded rape in all but one trial by an average of 18 per cent.

The yields per acre of digestible dry matter are shown in Table 2. These have been calculated from the mean yields of dry matter per acre less the amount wasted and eaten but not digested. Separate grazing trials have shown that an average of about 62 per cent. of the material grown

TABLE 2—DIGESTIBLE DRY MATTER IN LB. PER ACRE

Feed	Mean yield	Stubble wastage	Grazing wastage	Consumed		Digestible dry matter		
				per cent.	lb. per acre	per cent.	lb. per acre	Rape = 100
1.* All rape and lupin trials								
Rape	3,700	777	629	62	2,294	81.2	1,863	100
Lupin	4,194	964	629	62	2,600	70.8	1,841	99
Mixture	4,945	1,038	791	63	3,116	77.3	2,409	129
2.* Rape and Borre lupin trials only								
Rape	4,138	869	703	62	2,566	81.2	2,084	100
Lupin	5,175	1,190	776	62	3,209	70.8	2,271	109
Mixture	5,339	1,121	854	63	3,364	77.3	2,600	125

* Comparisons are valid only within figures of section 1 or within those of section 2.

TABLE 1—YIELD OF DRY MATTER IN LB. PER ACRE

Year	Trial No.	B.L.E. rape	Sweet Blue lupin	Mixture rape/lupin	Season	Comments
1946	A	2,832	1,978	3,820	Normal	Allison's and Thurston's trial using New Zealand Sweet Blue lupin
	B	2,815	2,485	4,492	Normal	
1952	C	6,848	7,169	9,060	Wet	Borre lupin yield trial
	D	5,027	4,880		Wet	Borre lupin grazing trial with 6 successive sowings
1953	E	2,920	5,240	4,505	Dry	Yield and grazing observations
1954	F	4,170	5,618	4,925	Dry but irrigated	Yield trial
	G	2,616	2,673	2,867	Very dry	Ashley Dene — grazing liveweight gains and yield
Mean yield						
(1) Trials with either New Zealand Sweet Blue or Borre lupin						
		3,700(100)*	4,194(113)	4,945 (134)		Comparisons of rape, lupin, and the mixture
		3,889(100)	4,290(110)			Comparisons of rape and lupin grown alone
(2) Trials with Borre lupin (excluding New Zealand Sweet Blue trials)						
		4,138(100)	5,175(125)	5,339 (129)		Comparisons of rape, lupin, and the mixture
		4,316(100)	5,116(118)			Comparisons of rape and lupin grown alone

* Figures in brackets are for comparative purposes, Broad Leaf Essex rape equalling 100.

was eaten, but this would naturally vary with conditions.

The dry matter digestibility percentages used are the average of three separate trials, two by Allison and Thurston and one by Crampton.

As the digestibility coefficients of a feed do not vary much, the figures given here would usually apply.

Table 2 shows that the mixture has outyielded rape in digestible dry matter per acre by a slightly lower percentage than it outyielded rape in dry matter per acre. Though Borre lupin yielded 18 per cent. more dry matter than rape, it yielded only 9 per cent. more digestible dry matter, because the digestibility of dry matter of lupin is lower than that of rape.

Table 3 records the calculated feed units per acre of the three feeds. A pound of digestible dry matter of one crop is likely to have a different feeding value from a pound of digestible dry matter of another crop, depending primarily on differences in chemical composition and relative digestibility of the individual constituents. For instance, plant oils or fats have double the feeding value of carbohydrates. The feed units of rape, sweet blue lupin, and the mixture were determined by Allison and Thurston, the mean values for two wethers in each of two trials being used in this table.

This table shows that whereas the mixture outyielded rape by 29 per cent. digestible dry matter, it outyielded it by only 22 per cent. of feed units. Similarly Borre lupin, which outyielded rape in digestible dry matter, is slightly outyielded by rape in feed units. On the average lambs that consume the same number of feed units per day make the same daily liveweight gains. A group of lambs that consumes more feed units per day than another group makes larger gains, as there are proportionally more feed units, above those needed for maintenance, available for fattening. There is some evidence that the intake of sheep grazing the mixture is higher than that of sheep grazing rape.

The dry matter yields for the trial at Ashley Dene are shown in Table 1. The average daily weight gain per lamb was .25lb. for lambs grazing the mixture, .22lb. for the lambs on rape, and .22lb. for the lambs on lupin. The average weight gain of each group of lambs was rather low, due probably to the feed being slightly over-mature and due to deterioration during the period of the trial. Whether the superiority of the mixture was a real or a chance difference could not be determined. The higher weight gain on the mixture was not unexpected, however, as these lambs ate more than the lambs on rape or lupin. It seems that the mixture is at least as good as rape in promoting liveweight gains.

It is concluded from these trials that for conditions of soil, climate, place in the rotation, and management similar to those in the Crop Research Division's trials the mixture of Borre lupin and Broad Leaf Essex rape is likely to outyield Broad Leaf Essex rape in lamb fattening capacity by about 20 per cent. Though this difference may be less in a good rape year, it is likely to be greater in a poor rape year, the very occasion on which good lamb fattening crops are so essential.

To summarise, the advantages of the mixture over rape alone were as follows:—

1. More certain crop establishment.
2. Better weed suppression.
3. Effect of insect attack, such as aphides, less pronounced.
4. Higher yields even in a dry season.
5. Faster weight increase of more lambs per acre.
6. Less annual variability in time from sowing to maturity.
7. The mixture appeared to be more palatable than rape.

The only disadvantages were the greater cost of seed and the small amount of extra time and work involved in sowing.

Recommendations for Farm Use

The mixture can be recommended for farm use as follows:—

Type of land: All except the heavier and the lighter.

Place in rotation: The yield advantages may not be so great where farming practices or rotations have built a high soil nitrogen level.

Cultivation: Cultivate as for rape to obtain a fine, reasonably firm seedbed.

Seed rate: With high-germinating seed use 1 bushel of Borre lupin and 1¼lb. of rape.

Fertilisers: A 2:1 mixture of superphosphate and ground limestone should be used at about 2cwt. per acre.

Time of sowing: From mid-October to early December in Canterbury.

Drilling: Sow the rape mixed with the fertiliser and the lupin from the grain box in 7in. drills. Drilling depth should be ¾in. to 1¼in., the greater depth in dry seasons or soils.

Feeding: To obtain the greatest carrying capacity and fattening rate the mixture should be fed off as soon as either the rape or lupin has reached maturity. In a dry season this will probably be the rape, in a wet season the lupin.

The correct stage of maturity for lupin is the early green pod stage, before the main stem becomes too woody or begins to drop the lower leaves. There is likely to be an increase in stubble wastage or a decrease in digestibility if feeding off is delayed too long after this stage. If there has been a succession of sowings, feeding off may begin at this stage. Where only one sowing has been made and grazing is to extend over several weeks feeding should begin correspondingly earlier.

TABLE 3—FEED UNITS (STARCH EQUIVALENTS) IN LB. PER ACRE

Feed	Dry matter consumed	Feed units per 100lb. dry matter	Feed units	
			lb. per acre	Rape = 100
1. All rape and lupin trials				
Rape	2,294	72	1,652	100
Lupin	2,600	56	1,456	88
Mixture	3,116	64.5	2,010	122
2. Rape and Borre lupin trials only				
Rape	2,566	72	1,848	100
Lupin	3,209	56	1,797	97
Mixture	3,364	64.5	2,170	117

EDITOR: A. G. G. HILL

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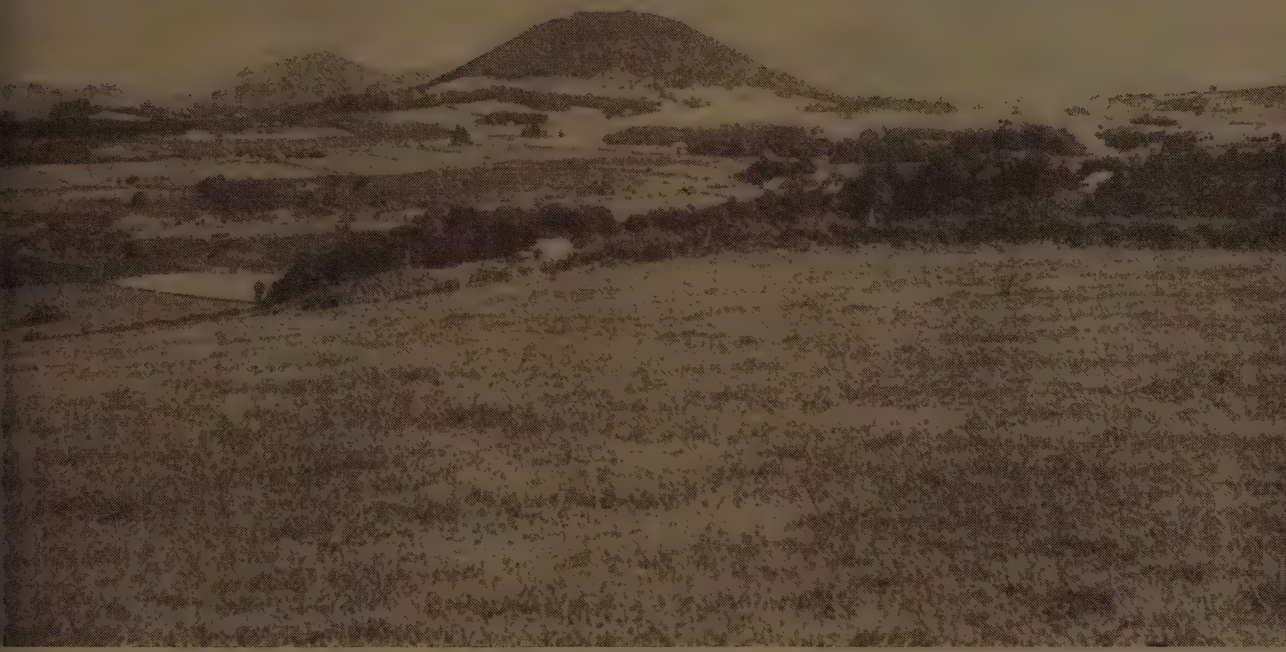
Pasture Topdressing in North Island



By C. DURING,
Research Officer, Department of Agriculture, Wellington

THIS article, concluding the series on topdressing requirements of pastures and lucerne on North Island soils, discusses requirements on soils derived from andesitic and basaltic lava flows and on soils derived from alluvium. The first and second parts of the series appeared in the July and August issues of the "Journal". In the series all the most important soil types of the North Island have been briefly discussed.

SOILS derived from andesitic and basaltic lava flows occur in the Auckland district. Some are fertile soils, but many are naturally very infertile and have posed fertility problems which had to be solved before they could be satisfactorily developed.

Soils derived from alluvium are also dealt with. Alluvium is defined as a deposit of gravels, sands, silts, or clays left by flowing water on areas not permanently submerged. In this article, however, soils derived from any fine material which has been moved from one place to another by the action of fresh water or ice are included among alluvial soils.

BROWN AND RED-BROWN VOLCANIC SOILS OF NORTHLAND AND AUCKLAND

In Northland extensive areas have been covered by flows of volcanic lava, basalts and andesitic formations being the most common. These rocks are high in iron, manganese, and magnesium. Owing to the warm, humid climate and the large percentage of easily weathered minerals, soil formation has been rapid.

In the early stages of weathering the high base content of soil water is said to inhibit the leaching of iron. Hence the topsoils are high in iron oxide, which gives them a dark brown to reddish brown colour and friability in spite of a high clay content.

From Basalt

Soils derived from basalt are popularly known as "volcanic" soils. The young soils are often rather shallow and may be bouldery. Though fairly high in clay, they are friable, drain well, and dry out easily. If not too shallow, they can be made to grow very good pastures by the regular application of superphosphate. Surprisingly, however, pastures are said to respond well to heavy dressings of lime (1 ton per acre) in spite of only moderate soil acidity (pH 6.0). Potash deficiencies are developing on most of these soils if they have been intensively farmed for some time.

The slightly older soils are more deeply weathered and hold good pastures. Fertiliser treatment is the same as for the young soils.

The more mature soils have developed on the oldest flat to slightly undulating basalt sheet of the Bay of Islands district (Kerikeri friable clay, Okaihau friable clay). The clay minerals high in iron, titanium, and manganese have undergone considerable crystallisation, leading to the formation of so-called ironstone nodules. The soils which have progressed most in this nodule formation are known as ironstone soils (for example, Okaihau gravelly friable

HEADING PHOTOGRAPH: The photograph is taken from the slopes of Maunu Hill, near Whangarei, a volcanic cone similar to the one in the distant centre. The soils, red-brown loams derived from basalt, are not yet highly leached. They dry out easily in summer, but winter and spring production can be relatively high if grassland management is designed to keep in plenty of ryegrass to give maximum pasture growth at those seasons. Production generally could be increased considerably if potassic fertilisers were used wherever they were needed. Liming and application of phosphatic fertilisers are standard treatments. The hills in the background are derived from dolerite and andesite on which brown granular clays have formed.

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Profile of Okaihau gravelly clay (ironstone soil) derived from an old basalt formation. This is one of the most leached and mature stages of soils derived from basalt in New Zealand. In places erosion has brought to the surface the iron or limonite nodules. These nodules are a product of crystallisation of fine clay minerals. During the process of crystallisation it is believed that several minor elements such as cobalt and molybdenum were made generally unavailable to plants. In its natural state this ironstone soil presents a picture of great infertility; only stunted manuka and a few other weeds are maintained by it. However, topdressing with moderate amounts of lime (10cwt. to 20cwt. per acre), of cobaltised phosphatic fertilisers, and of potash can establish and maintain good pastures. Pastures on this and other "volcanic" soils are sensitive to summer drought, making it necessary to preserve much ryegrass in the sward to obtain the maximum benefit from the mild winter and the wet, early spring. Fat lamb production is the ideal mode of farming.

clay). They may be considerably more acid than the less mature soils derived from basalt, but soil acidity is not generally excessive (pH 5.5 to 6.0). Lime and phosphate requirements are also no higher than on the younger soils, though if lime and phosphate are not applied to virgin soils, pastures are extremely poor and unproductive, whereas on the younger soils pastures of medium productivity can be grown without fertilisers. Potash deficiency, however, is more pronounced on the older and more leached soils than on the younger soils.

With increasing age the soils derived from basalt become slightly molybdenum deficient. In fact, on one of these soils, Okaihau friable clay, the first pasture response to molybdenum was demonstrated in 1945 (2).

Other trace element deficiencies may exist, but have not yet been sufficiently studied on pastures. (Zinc deficiencies have been found in commercial plantings of citrus trees.)

From Andesitic Rock Flows and Doleritic Extrusions

Andesitic and doleritic rocks contain more silica and less magnesium, iron, phosphorus, and other elements than does basalt. The andesitic rock flows cover a much larger area than do the doleritic extrusions and are therefore of much greater importance as a soil-forming parent material. The chemical composition of andesite in New Zealand is by no means uniform, however, some andesites being very similar to the basalts and containing only slightly more silica; others contain a good deal more silica. For this reason they have given rise to a great variety of soils all of which are described by the Soil Bureau as "brown granular clays".

These brown granular clays are popularly known as "semi-volcanic" soils and occur in fairly large blocks in the far north. For instance, they form an almost unbroken semi-circle extending from Ahipara Bay in the west to Doubtless Bay in the east. Farther south a triangular block extends from Hokianga Harbour to the centre of the Northland Peninsula and close to Dargaville. Smaller areas of andesite have formed the Waitakere Ranges near Auckland and much of the backbone of the Coromandel Peninsula.

As is common in Northland, topography seems to have strongly influenced the development of soils. The brown granular clays are no exception. The steeper the slope is the higher is the natural fertility, probably owing to the operation of two factors.

First, on the steeper slopes erosion has led to a gradual loss of topsoil and to its replacement by the less weathered subsoil which has retained a higher reserve of nutrients.

This profile belongs to a rolling soil (Whatoro clay) derived from andesitic basalt. Soils derived from andesitic basalts and andesites are called brown granular clays, a name which they owe to their granular structure and dark colour. Their common name is "semi-volcanic soils". The rolling, flat, and undulating soils of this group are of very low inherent fertility, largely owing to an acute deficiency of available molybdenum and phosphorus. Two feet to 3ft. below the surface a thin iron pan is commonly formed which has, however, little effect on drainage. Basic slag was until recently thought to be the only fertiliser which gave good results without heavy applications of lime (1 to 3 tons per acre). It is now thought likely that excellent pastures can be grown with molybdate superphosphate and a little lime.

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The soils in the foreground and centre consist mainly of Rangiuru clay and Pakotai clay, brown granular clays derived from andesite. The site is near Stoney Creek, Northland. There is a large proportion of scrub. In spite of the fairly large area occupied by these soils it was until recently difficult to find suitable pastures on which field experiments could be carried out. With the discovery of molybdenum deficiency, however, rapid development of scrubland and marked improvement of existing pastures are taking place. These soils are some of the most leached of the brown granular clays. In general terms this means that marked potash deficiency can be expected on improved pastures. It does not mean that for intensive farming lime and phosphate needs are higher than on related soils of slightly better original fertility. Trace element deficiencies other than that of molybdenum are being investigated.

Second, there is more run-off of rainfall on steep slopes and hence less leaching by percolating water; that is, there is less chance of removal of soluble nutrients. The larger area of granular clays receives on an average more than 60in. of rain per annum. Thus easy rolling soils (Aranga, Rangiuru, and Awarua clays) are of very poor natural fertility because of greater leaching by percolating rainwater. In fact they were regarded as problem soils until recently (1953), when it was found that they are extremely deficient in available molybdenum.

Before the results of molybdenum trials pointed to a successful way of establishing first-class pasture these soils could be brought into reasonably high production only by heavy expenditure on lime and superphosphate or on basic slag. Without lime the application of superphosphate resulted in little improvement. Basic slag, however, proved excellent on some of the brown granular clays even without the addition of lime.

The variability of parent material and of the resulting soil types must be borne in mind, and much more experimental work needs to be done, particularly to establish lime requirements once molybdenum has been applied, potash requirements, and requirements of trace elements other than molybdenum.

At present the following guide to topdressing of pastures on brown granular clays (semi-volcanic soils) can be given.

Steep and Hilly Soils

Two and a half ounces of sodium molybdate per acre is needed perhaps every 3 years on the steep and hilly soils. Superphosphate or serpentine superphosphate should be applied each year. The application of lime is probably not practicable and probably not needed. A typical soil type is Te Kie loam.

Rolling Soils

Molybdenum and superphosphate or serpentine superphosphate are required on the rolling soils. As these soils have a higher potential production, phosphatic topdressing should proceed at a higher rate than on the hilly soils. Lime equivalent to 1 ton of pure limestone per acre should be applied every 4 years. Potash deficiencies are likely to occur after some years of intensive farming. The severity of potash deficiency will depend on the management of individual fields and on the average

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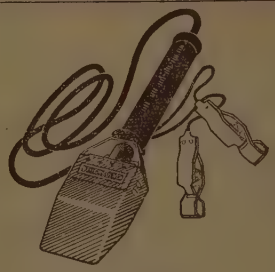

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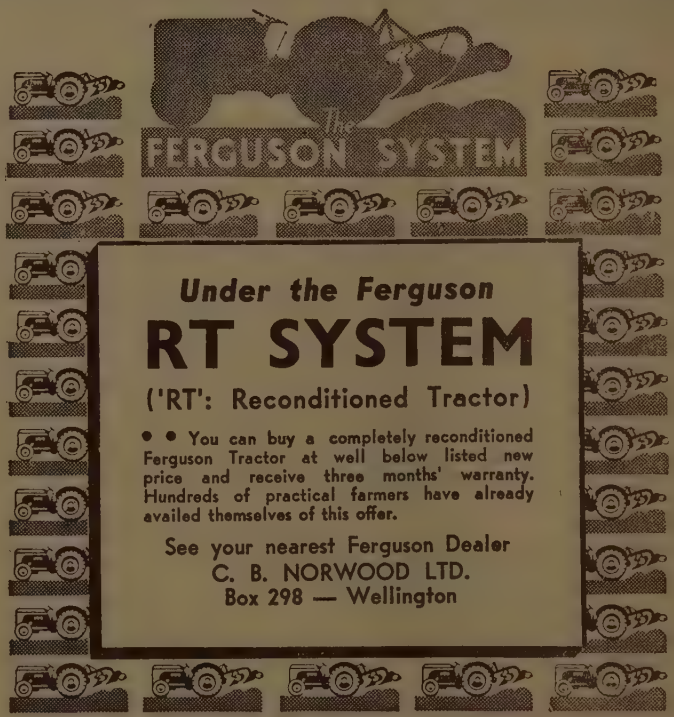

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annual rainfall. Deficiencies can probably be picked up by the Department's soil test. Typical soils are Waitakere clay, Waimatenui clay, and Mangonui clay.

Recent Alluvia

Soils derived from recent alluvial formations which contain andesite as a dominant fraction of their parent material are known or suspected to be molybdenum deficient. Their requirements are very similar to those of the hilly soils.

Easy Rolling Soils and Old Alluvial Terraces

As already mentioned these easy rolling or flat soils are the most leached of the series and also the ones which have a large proportion of their area in unproductive scrub. Owing to their topography, however, they are thought to have the highest potential value. Farmers, therefore, are now changing scrub into pastures as fast as their means allow.

Typical soil types in this group are Rangiuru clay, Awarua clay, Pakotai clay, and Aranga clay. Topdressing recommendations are at present the same as for the strongly rolling soils. However, there is some slight evidence that in addition to molybdenum other minor elements may play a minor role in pasture improvement. Small amounts of water-soluble vanadium salts have stimulated growth in a few pilot trials and the role of copper is also being studied.

Potash is almost certain to become an essential part of topdressing on these soils once pastures have been improved by phosphates, molybdenum, and lime. Potash deficiency increases markedly with leaching and higher rainfall; hence these soils of easy contour, being more leached than those on the steeper slopes, are certain to be more potash deficient.

SOILS DERIVED FROM RIVER ALLUVIUM

With every flood rivers deposit a mantle of silt, sand, clay, or gravel on the surrounding low-lying land, thus slowly building up a river flat. During this process their action is somewhat similar to that of the wind passing over volcanic ash eruptions; they drop the coarse particles first, and the fine particles remain suspended for a long time and are deposited farthest from their place of origin. The heavier alluvial soils made up from the smallest and lightest particles such as clay and fine silt are therefore usually found near the mouth of the river and the sands and gravels upstream.

Thus near the estuary the more fertile and heavier soils occur, but these regions are usually most subject to flooding and many have a permanently high water-table. One result of exposure to a high water-table for extended periods is what is called gleying. Gleys, also called meadow soils, are a common development among alluvial soils. They have a pale, compact, mottled subsoil often composed of sticky clay and have poor structure. The inadequate penetration of air caused by poor structure and waterlogging may limit root growth of plants and may raise soluble manganese to toxic levels, while reducing other elements such as molybdenum to the point of deficiency. When drained, however, gley soils usually become fertile and well suited for pasture and cropping.

Naturally the fertility of alluvial flats is largely influenced by the quality of the river deposits from which they are made up, but the age of the soil is also very important, more so probably than it is with the sloping soils. With sloping soils gradual erosion and considerable run-off of rain-water counteract the processes of leaching and soil deterioration. Leaching is the process by which percolating water removes soluble plant nutrients, leaving the soil less fertile and more acid.

River flats, on the other hand, escape relatively rapid depletion of plant nutrients only if the rainfall is low or if they carry fertility-retaining vegetation, such as good broadleaf bush.

Recent alluvial soils, if not subject to drought, are of higher fertility than the surrounding land. They are new soils without the usual disadvantages of new soils, namely shallowness and steepness. Nevertheless, poor parent material cannot make fertile soils. Thus alluvium derived almost entirely from the Moutere gravels of Waimea County cannot be as fertile as alluvium washed down from the steep but fertile mudstone hills of Gisborne.

The parent material of most alluvia is, however, mixed. Quite often much volcanic ash is present. Owing to these variations it is difficult to map these soils adequately on large-scale maps and it is unwise to generalise on fertiliser requirements. For this reason chemical soil analyses carried out by the Department of Agriculture and assisted by the identification of the most important components of the soil-forming material are an especially valuable aid in giving advice on topdressing with phosphate, potash, and lime. The identification of the parent materials of which the alluvial soil consists is necessary so that the results of field experiments carried out on soils derived from such parent materials can be used for the interpretation of the soil analyses.

A knowledge of the parent material may also be valuable in anticipating trace element deficiencies which may either affect pasture growth or stock health and which cannot be as yet

A profile of Rangiuru clay east of Kaitaia. This soil, derived from andesite, is strongly weathered and strongly leached. The granular structure and large cracks in the topsoil give the soil an almost loose appearance in spite of a reasonably high clay content. Iron nodules as seen here are not always present. These brown granular clays, popularly called semi-volcanic soils, dry out very easily, as much of the water which they may contain is not available to plants. They are therefore more suitable for fat lamb farming than dairying.

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▲ Typical dairying land near Norsewood with the Ruahine Ranges in the background. The soil is derived from old alluvial greywacke gravels and silts and a sprinkling of volcanic ash. Pastures on these soils (Kopua soils) respond well to superphosphate and lime. Potash deficiency is probably fairly widespread and little is being done to correct it.

[*Department of Scientific and Industrial Research*

← Profile of an old alluvial soil near Carterton, Wairarapa, showing the layer of gravel which makes pastures on this soil (Takapau stony loam) very subject to drought. Light, stony soils of this type, which are developed on old greywacke gravel beds, respond well to lime and superphosphate. In low-rainfall districts only phosphatic fertilisers containing sulphur should be used until there is evidence that sulphur is not needed. Some of these soils are also low in available cobalt. In districts with high rainfall potash deficiency is likely to develop.

diagnosed by chemical analysis. For instance, some highly fertile alluvia and gley soils derived from limestone and mudstone need to be topdressed with copper to produce healthy pastures.

OLD ALLUVIAL SOILS

From Greywacke Alluvium Gravels and Sands

Considerable areas of soils derived from greywacke alluvium gravels and sands occur on old alluvial flats on the Ruataniwha and Takapau Plains in mid-Hawke's Bay and north of Marton. Farther south they are dominant in the dissected plains of the Dannevirke-Norsewood district and they form fairly large blocks of country in the Horowhenua district and in south Wairarapa.

Unlike soils which have developed slowly on solid greywacke rock these soils have developed from silts, coarse sand, and greywacke gravels. Varying amounts of volcanic ash which have been deposited from the air over the ages are also present. The often coarse or sandy parent material has helped air and water to penetrate easily, thereby encouraging the rapid oxidation of iron compounds to considerable depth. The presence of relatively large amounts of iron oxides is thought to be responsible for the good structure of these soils (1), a structure somewhat resembling that of soils derived entirely from volcanic ash.

Pasture Responses

The following pasture responses are obtained on the flat to undulating soils of the Wairarapa, southern Hawke's Bay, and Manawatu districts (the more important soils in this group are Takapau silt loam and stony loam, the Kiwitea soils, and Kopua silt loam and stony loam):—

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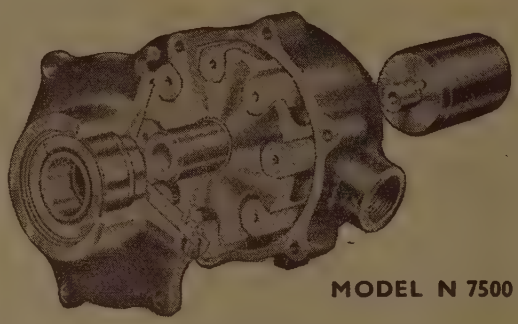

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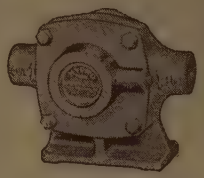

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A succession of ash-shower beds in a road cutting north of Kimbolton, near Feilding. This soil (Kimbolton loam) is friable and well drained and is fertile if topdressed with superphosphate. The district in which it occurs is famous for its flocks of stud sheep.

Potash responses are likely in districts with high rainfall, 60in. and over (near Dannevirke), and on light stony soils. As usual, fields frequently cropped or cut for hay are the first to show responses. Farmers, however, have made surprisingly little use of potassic fertilisers.

Molybdenum seems adequate in almost all cases, but slight responses to the application of 2½oz. of sodium molybdate are obtained on Judgeford silt loam near Wellington.

Seasonal sulphur deficiencies are likely to occur on the light stony soils in the areas of lowest rainfall (southern Wairarapa and Horowhenua districts). Sulphur deficiencies, however, are righted by the use of sulphur-containing phosphatic fertilisers such as superphosphate.

Boron deficiency symptoms appear occasionally in lucerne on light stony soils, particularly in dry seasons.

Cobalt deficiencies have been discovered on small areas of the light stony soils of the Wairarapa and are suspected on similar soils in Hawke's Bay.

From a Mixture of Sedimentary Rocks and Volcanic Ash

Many soils in the southern part of the North Island, that is in Hawke's Bay, north Wairarapa, and the Manawatu, are derived from a mixture of volcanic ash and sedimentary rock.

The hilly soils of this group are well represented along the foothills on both sides of the Ruahines and the northern Tararuas (that is, Matamau soils). The flat and undulating soils of this group are found in quite a large block west of Dannevirke (Matamau soils), in the Kimbolton district (Kimbolton loam), and near Levin (Levin silt loam).

Pasture Responses

Pastures on the hill soils of the Matamau series respond slightly to the application of molybdenum, and they respond well to superphosphate and serpentine superphosphate and heavy liming at 1 ton per acre. On the hill soils this rate of liming is, of course, not economic. For this reason experiments with light rates of lime were laid down. Results from these experiments show that lime applied at 3cwt. to 5cwt. per acre with adequate amounts of phosphate and an initial dressing of molybdenum is little inferior to heavier dressings of lime on the Matamau soils of the Manawatu district.

The Matamau soils near Dannevirke occur under high rainfall (60in. to 80in. annual average). They respond very well to lime in spite of a reasonably high pH (5.5 to 6.0) and to phosphatic fertilisers. Though good lime responses at pH 5.5 to 6.0 are often associated with molybdenum deficiency, no such deficiency has been proven in experiments using 2½oz. of sodium molybdate per acre. Pasture responses to potassic topdressing are always expected where the rainfall exceeds 60in. per annum. So far, however, there is no recent experimental evidence with regard to potash deficiency. Farmers are using only phosphatic fertilisers and a little lime.

The parent material of the flat and undulating soils of the Kimbolton district (Kimbolton loam) has been mainly developed from an old volcanic ash shower. Little is known about the manurial requirements of pastures on this soil except that regular dressings of phosphatic fertilisers are beneficial. Superphosphate is also the main and perhaps the only requirement of Levin silt loam.

Acknowledgment

The subject matter of these articles has been collected from results from numerous field trials carried out by instructors of the Extension Division from 1928 to 1955. These results have been correlated on a soil-type basis (3). Invaluable help has been provided also by officers of the Soil Bureau, Department of Scientific and Industrial Research.

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Persistency of Short-rotation Ryegrass under Flood Irrigation

By G. K. McPHERSON,
Irrigation Research Officer, Department of Agriculture Irrigation Research Station, Winchmore

A FERTILE soil coupled with a high rainfall favours the permanency of short-rotation ryegrass in a sward. The type of grazing, whether by cattle or sheep, and the management of the sward under these two types of grazing are also major factors influencing its permanency. Some evidence of how short-rotation ryegrass behaves on light Canterbury Plains soil under irrigation is already available, but more is required before its place can be correctly assessed.

AS seems natural, evidence so far suggests that it is a much easier proposition to maintain short-rotation ryegrass in a sward under cattle grazing than under sheep grazing. One paddock on the dairy farm of the Department of Agriculture's Winchmore Irrigation Station sown 10 years ago in short-rotation ryegrass and red and white clover still has a good balance of short-rotation ryegrass in the sward. This paddock, however, receives the washings from both the dairy and the piggery and for that reason the test of its permanency capabilities may not be a fair one.

On another paddock sown 6 years ago a good proportion of short-rotation ryegrass still persists in the sward. This paddock has been subjected to normal dairy farm grazing; for the past 4 years it has been used to produce winter-saved grass and on two occasions, January 1952 and February 1955, it has been hayed.

The evidence from this paddock and from younger short-rotation ryegrass paddocks on the dairy unit is that provided haying of the areas can be done periodically and that irrigations can be applied after haying to germinate and maintain the growth of the seedling plants, there are reasonable prospects of maintaining short-rotation ryegrass in the sward for several years.

Swards under Sheep Grazing

Retention of short-rotation ryegrass in a sward under sheep grazing is more difficult to attain. Pastures sown down 7 years ago with short-rotation ryegrass as one of the constituents and subjected to consistent grazing with sheep since and periodical haying today contain very little short-rotation ryegrass except in the crutch of the levees, where the soil fertility has been built up with dung and urine.

An attempt has been made to reintroduce short-rotation ryegrass into some of these swards with apparently satisfactory results. In the autumn of 1955, for example, two small paddocks were oversown with 1 bushel of short-rotation ryegrass per acre. During the following winter they were used as run-off paddocks and in the spring grazed with ewes and lambs. In late December the paddocks were closed for hay, which was cut and baled in March 1956. The strike from the reseeding after the late hay crop has produced an excellent sward.

The necessity for a reasonable number of irrigations to maintain short-rotation ryegrass in the sward during drought periods has been well exemplified during the past dry summer. In December 1955 and January 1956 practically no rain of any consequence fell and paddocks of short-rotation ryegrass irrigated on two occasions only during this time lost the bulk of the short-rotation ryegrass from the sward and became clover dominant. On the other hand paddocks receiving 3 irrigations in the same time today contain a much better cover of short-rotation ryegrass.

Effect of Heavy Stocking

A trial is in progress at present on the Station to determine the effect of heavy stocking on the growth of short-rotation ryegrass under irrigation. On a 27-acre block 6 acres have been sown in perennial ryegrass and white clover and the balance in short-rotation ryegrass and white clover with dogstail, cocksfoot, and timothy in addition. The whole area is now being stocked at the rate of 7 breeding ewes per acre. Some useful information on the behaviour of short-rotation ryegrass under irrigation should result from this trial.

At present it appears that careful management is necessary if short-rotation ryegrass is to be retained in an irrigated sward grazed solely by sheep. It is quite obvious it will not stand the treatment to which perennial ryegrass pastures are usually subjected. Some factors which will assist in its retention in the sward are:—

1. Relatively lenient grazing, particularly in summer and winter.

2. Adequate irrigations during drought periods.

3. Oversowing where necessary.

4. Re-establishment by haying, preferably late haying, say, in January and February.

The effect of topdressing with nitrogenous fertilisers on the maintenance of short-rotation ryegrass in the sward has not yet been investigated.

Importance of Plant Quarantine in New Zealand's Economy

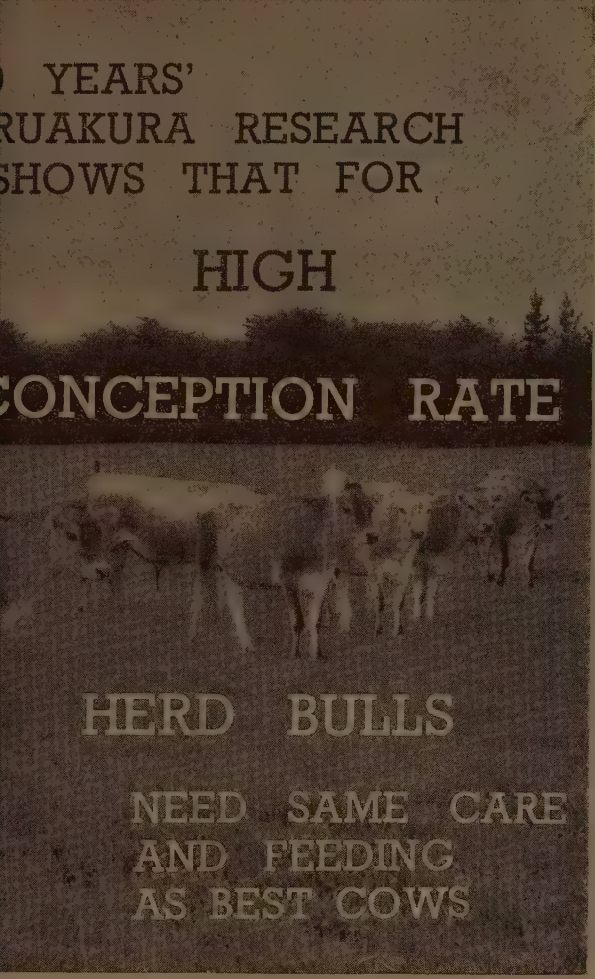
NOWADAYS, with the barriers of time and distance greatly reduced through the use of aircraft and fast shipping, the spread of all kinds of pests and diseases from one country to another is all too easy.

For this reason the Plant Quarantine Regulations of 1952 were designed to prevent the entry to the Dominion of undesirable plants and plant pests and diseases.

Though New Zealand has its share of agricultural and horticultural pests and diseases which have to be sprayed and dusted to be kept in check, the introduction of many other troubles which beset other countries has been prevented. If these troubles became established here, they would not only be costly to control and difficult to eradicate, but could jeopardise the livelihood of many farmers, orchardists, and market gardeners. More important still, they could have a serious effect on the export trade; most countries demand a certificate that certain pests and diseases do not exist in this country before they will accept our produce. The existence of any such pest or disease could therefore result in overseas markets being closed against us.

To prevent the introduction of destructive pests and plant diseases the Dominion's plant quarantine laws must be strict, and they demand that imported fruit, vegetables, plants, and seeds are accompanied by health certificates and are inspected on arrival. Before most nursery stock can be imported a permit must be secured from the Director of the Horticulture Division, Wellington.

The plant quarantine service is maintained by special staff of the Horticulture Division of the Department of Agriculture—Plant Quarantine Officers. Their duties include inspecting plants and seeds for export and issuing health certificates, inspecting all plant material imported, meeting and clearing overseas aircraft and ships, and operating up-to-date fumigation equipment. Vacancies in the plant quarantine service occur from time to time. Anyone familiar with horticultural or agricultural crops and the commoner pests and diseases which affect them and who is interested in the plant quarantine service as a career is eligible for appointment. In-service training follows appointment. Additional information about this work can be obtained from the Director, Horticulture Division, P.O. Box 1500, Wellington.



IN the past much attention has been paid to factors affecting the fertility of female members of the dairy herd, but the bull has been regarded as a first-class nuisance. This attitude is wrong, because a bull of lowered fertility will cause large production losses even though the cows may be of the highest possible fertility. In this article factors of management that can affect the fertility of the herd sire are discussed by R. M. Gallagher of the Department of Agriculture's Ruakura Animal Research Station, Hamilton. The recommendations are based on nearly 10 years of research with identical twin bulls.

UNDER New Zealand conditions of seasonal dairying a high conception rate is essential to the economy of the dairy industry. Much attention is paid to factors which may affect the ability of a cow to conceive at her first mating, but the fertility of the bull, which on a herd basis is much more important, tends to be neglected.

The importance of the bull is in better perspective if it is realised that each cow is responsible for one conception per year, whereas the bull is mated with 50 to 70 cows, and no matter how high the cows' fertility may be, the final conception rate depends, in the main, on the bull's ability to fertilise.

New Zealand farmers generally realise the great importance of controlling the time of calving of their herd so that feed demands can be fitted to feed supply. Consequently many go to a lot of trouble and expense with various treatments sometimes involving complex mineral mixtures in the belief that they may be increasing the percentage of cows that hold to first mating. Almost unheard of is the farmer who gives his bulls any special treatment before the mating season.

Fully aware of the lack of knowledge concerning the best treatment of bulls, Ruakura Animal Research Station started investigations into the factors which affect a bull's fertility. From a practical viewpoint good fertility can be deemed as the ability of a bull to serve and fertilise a maximum number of cows. Now after 10 years of research involving some 40 sets of identical twin bulls some worthwhile recommendations can be made to the dairyman.

Body Condition

It was found that the first essential of good fertility is good condition. The average farmer's idea of "good, hard service condition" was found to be too low for best results. There is a direct correlation between body-weight and total sperm production per service. High-conditioned bulls produce more sperm than thin bulls. These results have been established by comparing twin mates varying from very thin to very fat.

An experiment with twins to compare the effects on fertility of plane of nutrition from weaning onward showed that poor yearling bulls could be almost sterile from a practical point of view. Though these poor-condition bulls could possibly have "settled" satisfactorily a group of 8 to 10 heifers, very different results would have been obtained if these same bulls had been run with 15 to 20 heifers, as many are called on to do. When these low-conditioned yearlings were later placed on a high plane of nutrition their ability to fertilise increased as they gained in weight until, when they were finally at the same body condition as their well-fed mates, no difference in fertility could be measured.

Type of Feed

The type of feed used, provided it maintained the bull in good condition, was unimportant. Average spring pasture in adequate supply gave as good results as elaborate and expensive meal mixtures. Pasture of reasonable quality also supplied all the minerals and vitamins required by a bull, as several experiments involving the addition of minerals and vitamins to rations failed to produce any measurable difference in fertility.

Keenness

During the experiments on body condition a careful check was kept of the time taken by each bull to serve, in order to test the common belief that a bull, when fat, is slower to serve. All these trials as well as later work failed to show any grounds for the belief. In fact the marked variation in keenness between sets of twin bulls and marked similarity of keenness in twin mates indicated that keenness is an inherited factor and that very high body condition may be a result of slowness to serve rather than the reverse.

Another belief among farmers is that keenness and fertility are related. This was most noticeable when fertility diagnostic work was done. Many farmers become suspicious as soon as their bull becomes slow. In general the belief is wrong. Many bulls incapable of getting a single cow in calf are very keen to serve.

Temperament

Before a cow can be a good producer she must be of good dairy temperament, but what of the bull? By grading the twin sets into good and bad temperament groups and then examining the many thousands of semen records available the answer was obtained. No difference could be found in the fertility of good and bad tempered bulls, but the marked variation in temperament between

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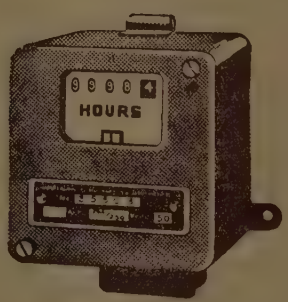

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the different sets of twins indicates that temperament is strongly inherited and is a character well worth consideration for many reasons apart from fertility when a herd sire is being chosen.

Inheritance

Working with identical twin bulls provided unique opportunity to determine the extent to which the performance of the dairy bull is dependent on heredity as compared with environmental factors. It was found that the volume of semen, its quality, and the bull's keenness to serve are all very greatly conditioned by inheritance. This information can be made use of. Bulls should be selected from breeders whose herds have a good fertility record. Beware of herds with a large percentage of empty cows and a large spread in calving dates.

Management at Mating

From field observations and the data gathered in the collection of some 8000 services from identical twin bulls plus information gained by conducting a fertility diagnostic service some other suggestions on management can be made.

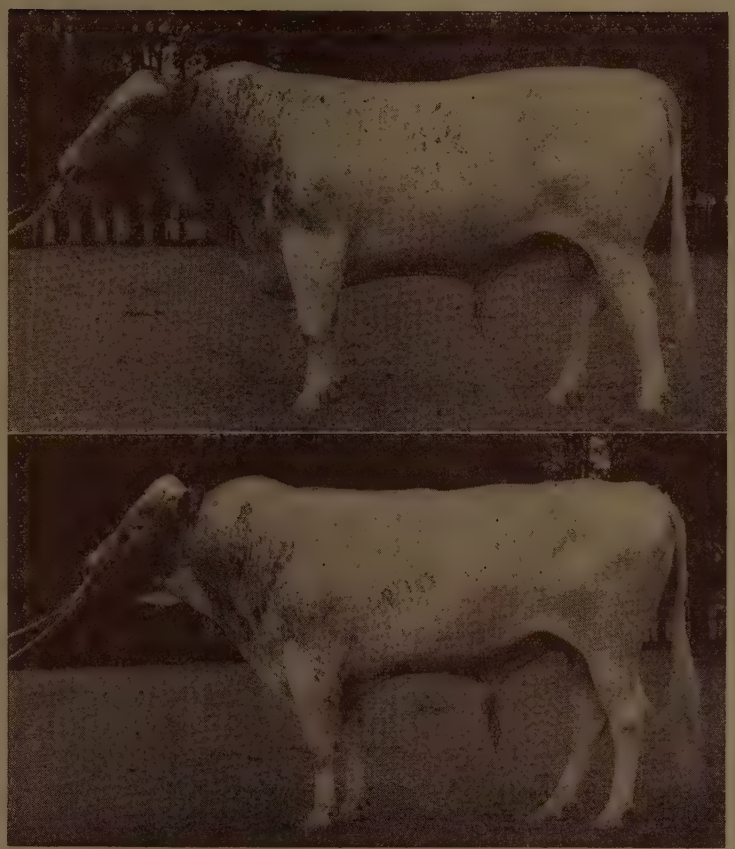
Good experimental evidence has been obtained to show that excessive use as a yearling will reduce fertility in later life. For best results a yearling should not be run with more than 12 to 14 heifers, unless some effort is made to reduce the amount of work he will do. Observations under free range mating showed that each heifer was served about 6 times during a heat. Accordingly 12 to 14 heifers represent something in excess of 100 services, the majority of which are concentrated into the first 3 weeks.

Particularly if the yearling is a valuable animal, intended to be kept as a herd sire and later progeny tested or surveyed, some effort should be made to limit his work.

If there are more than a dozen heifers to be mated, work can be reduced by hand mating for the first 3 weeks, but as some heifers are difficult to detect in heat, it is usually easier to run the bull during the day only and by keeping a close watch remove any heifer from the mob immediately she has been served. Very good conception rates have been obtained this way and the risk of missing any heifer which comes in heat during the night is slight.

This practice has been followed with good results at one of the Ruakura dairies for the past 12 years, involving some 330 yearlings.

Mature bulls should always be hand mated. After the first three or four cows of the season they should be allowed one service only. An average Jersey bull in work will produce about 3000 million sperm per service and nothing is gained by doubling this number. By two services per cow being allowed, the work potential of a bull is halved and this, in fact, often means that an extra bull has to be kept. The New Zealand Dairy Board fertility survey of 1944 showed that there was no decline in conception rate with up to 70 hand matings per mature bull, but above this number the conception rate declined markedly. Where more than one bull is kept, hand mating allows cows which return to be served again by the same bull, and so obviates the dangers of disease spread associated with mixed matings.



On test the fatter bull (T2, upper) produced over twice as many live sperms per service as his thinner identical mate (T1, lower).

Another interesting fact which came from the Dairy Board survey is that there is no noticeable decline in conception rate in bulls up to 8 years of age, though the number of cows they will mate successfully may decrease. This is substantiated by the Ruakura twin studies and fertility diagnostic work. Until 8 years of age a bull will usually retain his fertility. Well-treated bulls may be capable of some work up until 13 years of age, but from 8 years onward the onset of low fertility is usually fairly rapid and a fertility test before each season is a worthwhile precaution after this stage.

Summary

Have bulls in high condition at the beginning of each mating season and keep them that way. They will be no more sluggish to serve and will be capable of far more work.

There is no sensible alternative to hand mating the main herd. The likely gains from allowing multiple services are small and the positive losses great. Each cow should be served by only the one bull; do not mix mate.

Do not judge a bull's fertility by his keenness to serve. Sterile bulls are often keen, and slow bulls can be highly fertile.

Do not jeopardise the future fertility of a valuable yearling by overworking him.

Finally, give bulls the same care and feeding that are given the best cows. Select bulls from herds with a good fertility record.

Growing the Plants

HOME growing of planting stock has many advantages; the most desirable strain can be propagated if care has been exercised in the choice of parent seed trees, the plants can be lifted fresh from the nursery when time and weather are right for planting, they are acclimatised to the locality, and they cost little more than the time and energy put into an interesting job. This article by W. H. Jolliffe, Extension Forestry Officer, New Zealand Forest Service, will help those who wish to raise their own trees.

ANY garden soil can be used for the propagation of trees, but a deep friable soil and good drainage are more important than high fertility. Indeed, an over-rich soil may produce soft, lush growth which will not endure when seedlings are planted out in their permanent site.

Forming the Seed-bed

The area to be used for the spring sowing of tree seed should have been prepared the previous autumn by deep digging or trenching in the same way as the normal kitchen garden is prepared. The texture of the soil may have to be improved by digging in some organic matter such as straw or sawdust. If sawdust is used, a light dressing of a nitrogenous fertiliser such as sulphate of ammonia will assist decomposition. Other fertilisers should be used very sparingly and only if the land is poor. On no account should lime be applied if coniferous trees are being grown.

Most species are sown in a raised bed about 3ft. wide and of whatever length is necessary to produce the required number of plants. The length needed can be calculated by assuming that 600 1-year-old trees or 150 2-year-old trees can be grown on each yard of 3ft.-wide bed.

Seed-bed frames raised to allow the seedlings to harden off.

Sowing seed in bands in a raised bed.

The raising of the surface of the bed is done by scooping out the top-soil from the strips which will form the side paths and throwing this material on the bed area. A few weeks before sowing, the soil should be well worked to a fine tilth and the surface raked level and free of stones. A final raking should be given just before sowing.

Sowing Seed

Sowing is done in spring (September or October). Common practice in a 3ft.-wide bed is the use of three 6in. bands separated by 6in. spaces. The bands are made by laying a 6in.-wide plank along the bed 3in. from one edge and walking on it, thus making a shallow depression with an even bottom. The plank is then moved 6in. from and parallel to the first band and again walked on. The process is repeated for the third band, which should have its outer edge 3in. from the other edge of the bed.

In these bands the seed is spread evenly. The aim is to attain a crop spaced 1in. x 1in. if the trees are to be removed as yearlings or 2in. x 2in. if they are to stay in the bed for 2 years. Consequently it is desirable to know the germinative capacity of the seed being sown; if this cannot be found out before sowing begins, the following table will give a rough guide to the commoner species.

NUMBER OF SEEDLINGS FOR 1LB. OF SEED

Species	No. of seedlings
Radiata pine (*Pinus radiata*)	10,000
Corsican pine (*P. laricio*) ..	16,000
Ponderosa pine (*P. ponderosa*)	4,000
Macrocarpa (*Cupressus macrocarpa*)	7,000
Lawson's cypress (*Chamaecyparis lawsoniana*) ..	25,000
Douglas fir (*Pseudotsuga taxifolia*)	15,000
Larch (*Lariz decidua*) ..	6,000
Western red cedar (*Thuya plicata*)	60,000
Eucalyptus botryoides ..	120,000
E. viminalis	1,000,000

The seed spread in the bands should be firmed by pressure on the board used in making the bands and should then be covered with finely sifted soil or sand. Sand is preferable if the soil is inclined to cake. The depth to which the seed is covered depends on its size; as a rough guide cover the seed with soil of a depth twice the thickness of the seed. Thus fine seed like that of eucalypts should be only just covered, but that of pines should have up to ¼in. of cover.

Protection of Beds

In most parts of New Zealand better results are obtained if beds in the early stages are protected against drying by sun and wind, against unseasonable frosts, and against loss of seed by mice and birds. Protection is usually given by frames with sides and ends of 6in.-wide to 8in.-wide boards over which is stretched coarse wire netting. The netting is covered with open-weave scrim, leafy branches, or slats, the covering being kept in place by wires stretched from end to end.

Such protection tends to produce conditions similar to those on the forest floor and at the same time combats the ravages of mice and birds. The result is a better strike and a bed which does not require watering except perhaps in an unusually dry spell.

Weeding is necessary throughout the period from the sowing of the seed to the lifting of the young trees. Certain hormone weedkillers are claimed to be safe for application among conifers, but they should be used with caution. The surest method is to weed by hand.

Later in the growing season the young trees have to be hardened off. This is done by raising one side of the frame for a short time each day, the time of exposure being increased gradually until the frames can be removed completely. The final removal is best reserved for a dull or a wet day.

Tussock Grassland Research in the Broken River Area

By A. R. DINGWALL,
Fields Superintendent, Department of Agriculture, Christchurch

PARTICIPATION by the Department of Agriculture in research into the problems of regenerating and improving the high country tussock grasslands of the South Island was initiated by A. McPherson in 1910-13 with the establishment of regrassing trials on the depleted tussock country of the Earnscleugh Station, Central Otago, and the Haldon, Sawdon, and Simon's Pass Stations in the Mackenzie Country. After the interruption of the First World War L. Cockayne made further sowings at Earnscleugh and laid down new trials on the Northburn Run at Lowburn Ferry in 1920-22. In the late 1920s and during the depression of the early 1930s little experimental work was attempted, though progress on the earlier trials was noted and reported on from time to time by F. Ward, R. McGillivray, and R. B. Tennent. It was not until the post-depression era of the 1930s to 1944 that further trials were established, this time by G. G. Calder on the Pisa Flats of Tarras, Central Otago.

THUS during the first 35 years of investigations national emergencies, financial depressions, changes in staff, and lack of adequate trained staff and finance broke the continuity of research and gave rise to the attendant difficulties that beset experimental progress under such circumstances.

The Changing Scene

Within the past 10 years the changing scene has fostered a growing interest in tussock grassland problems and a marked revival in high country investigations. Improved land tenures, an era of very favourable wool prices, the adoption of aerial and other mechanical aids to high country farming, and an awakened realisation of the urgent need for tussock grassland improvement have been mainly responsible for this revival.

Probably the greatest stimulus lies in the fact that in these more affluent times runholders—perhaps for the first time in a century of high country farming—are in a position to finance the practical application of any worthwhile findings of research. Furthermore, they are interested in doing so. This in itself has encouraged the research worker in his efforts to discover some practical solutions to the many problems of tussock grassland management.

Recent Developments

Consequently within the past 10 years field officers of the Department of Agriculture—and others interested, such as the Department of Scientific and Industrial Research, Department of Lands and Survey, the Wildlife Division of the Department of Internal Affairs, the New Zealand Forest Service, the Soil Conservation and Rivers Control Council and catchment boards, and Canterbury Agricultural College—have intensified their investigations and research. Since 1945 J. Hercus in Central Otago has continued observations at Pisa and expanded operations to include areas of Fruitlands, Ophir, Kane's Block (Hawea Flat), and other localities. A plant-introduction nursery and oversowing, topdressing, and management trials have been established and plant (ecological) and sheep grazing studies are among the main investigations being conducted.

← Natural cover of fescue and blue tussock with browntop, sweet vernal, and stunted matagouri and tauhinu.

Upper—Clover establishment from seed that has been surface broadcast. Lower—Clover establishment from seed that has been subsurface drilled with grassland tips.

In the Mackenzie Country H. M. Sievwright, working on the evidence of the early Haldon, Sawdon, Whalesback, and Simon's Pass trials and a lifetime of close association with high country farming, has established a plant nursery (Mt. Hay Station); species and strains, seeds mixtures, and method of sowing trials and an extensive grazing area at Holbrook; large-scale oversowing and topdressing trials in the Mackenzie Pass area (in co-operation with the South Canterbury Catchment Board); a seed multiplication area (at Simon's Hill and in conjunction with Mackenzie Country runholders); and numerous topdressing and oversowing trials, plant studies, and vegetative cover and aerial oversowing surveys throughout the area.

Research activities have also extended to several other sections of the vast Canterbury tussock grasslands and are now located in the watersheds of the Rangitata, Ashburton, Rakaia, and Waimakariri Rivers.

Waimakariri Basin

Most early research was done in depleted, low-rainfall tussock country. A section that has received more attention recently is the higher-rainfall area (40in. to 60in. per annum) of the Waimakariri River basin.

The Department's research programme in this area was initiated by T. G. Sewell in 1945-46 with a number of topdressing and oversowing trials and the continuation of plant studies. Sewell also started the plant-introduction nursery at Craigieburn, where some 80 odd species, or strains, of both introduced and native grasses and legumes have been tested. Other investigations and experiments conducted by this officer from 1946 to 1952 involved chemical methods of weed control—mainly on sweet brier, gorse, and broom—studies of the effects of burning and spelling on fescue tussock and snowgrass communities, and surveys of the vegetative cover of Tawera and adjoining counties and of run-country management.

▲ Lucerne-cocksfoot-tall oat grass mixture on winter-fallowed area.

▲ Lucerne-cocksfoot-tall oat grass mixture on non-fallowed area.

With the writer, Sewell also began the Riversdale trials in 1951. This area was originally intended for plot sowings of seeds mixtures containing promising species from the nursery rows at Craigieburn. Its trials were subsequently extended to include control of arable weeds, methods of sowing, and trace-element topdressing trials on the sodbound browntop-creeping fog sward developed on the once fairly intensively cultivated fescue tussock country.

From 1952 onward L. C. Bascand and the writer have continued observations on Sewell's experiments and have expanded the scope of topdressing, oversowing, and chemical weed control experiments.

Broken River Area

The latest research development on the hard (fescue) tussock country of the Waimakariri River watershed consists of a comprehensive series of trials in the Broken River area. These trials are located on Flock Hill Station at an altitude of approximately 2400ft. and in an area of waning fescue tussock sward typically invaded by aggressive introduced grasses of low productivity such as browntop and sweet vernal. This ploughable area of high terrace country lies exposed to north-west and southerly winds and winter snows and has an annual rainfall of about 45in.

Soil type is in the Cass group, the fine, sandy-textured, fluffy topsoil overlying yellowish brown to yellowish grey, silty subsoils over deep gravel. The soil is moderately acid and low in phosphate, exchangeable calcium, and available nitrogen. The potash status is fairly satisfactory, but both molybdenum and boron are likely deficiencies. Sulphur may also be inadequate, as it is in the Tasman soils of the Riversdale trials.

Method of Sowing and Manurial Trials

Research at Broken River began in the spring of 1953 with a pilot trial to compare different methods of sowing and lime and fertiliser responses. The method of sowing section included three methods of seed introduction into undisturbed or relatively undisturbed tussock. These consisted of: 1, subsurface drilling of seed and fertiliser with grassland tips fitted to ordinary drill coulters; and 2 and 3, surface broadcasting on (a) an undisturbed surface and (b) after pitchpole harrowing of the original sward.

A base dressing of superphosphate (1½cwt. per acre) was used on all plots, and cross-treatments of lime (10cwt.) and sodium molybdate (2½oz.) were applied.

The manurial series included three rates of phosphate (1½cwt., 3cwt., and 6cwt. per acre) and fertiliser combinations of superphosphate (3cwt.), molybdenum (2½oz.), nitrogen (1cwt. of ammonium nitrate-lime), and potash (1cwt. of muriate of potash). Lime at 1 ton per acre was applied as a base dressing on all plots.

Seeds mixtures employed on these two trials consisted mainly of perennial ryegrass (10lb. per acre), cocksfoot (5lb.), Montgomery red clover (3lb.), and 2lb. each of alsike and white clover. Intermediate wheat grass (*Agropyron intermedium*) at 10lb. and short-rotation ryegrass at 5lb. were also included on the manurial series where the rate of sowing was 30lb. per acre. The method of sowing trial was sown at 20lb. per acre.

Establishment Methods

Tussock grassland improvement work in the past has shown that many clovers and other legumes, such as lucerne, can be established readily either by surface sowing or subsurface drilling in the natural tussock swards. On the other hand, grass species are much more difficult to strike unless

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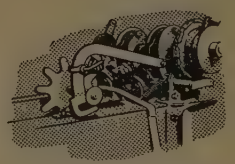

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the ground is first ploughed and cultivated, thus destroying the native vegetation, or unless some other form of surface tilth is achieved.

The practice of improving extensive tracts of tussock country by cultivation is not considered highly desirable, as the retention of natural tussock cover in high country environments has many decided advantages. However, many runholders regularly cultivate a limited amount of their arable run country, mainly to provide winter feed for young stock. Under this system high country pastures are sometimes sown down on ploughed land.

To determine the best methods of establishing pastures on arable tussock country a second and more comprehensive series of experiments was started at Broken River in the spring of 1954. Here, different types of permanent pasture swards are being sown down under varying pre-treatments. These variants include sowing direct out of tussock, with and without a preceding winter fallow, or, following various crop rotations and/or after 1 year, 2 years, or 3 years of temporary pastures. Comparative methods of sowing, such as drilling in 7in. and 3½in. (broadcast coulter) row spacings, and surface broadcast and rolling, and with or without cover crops, are also being tried.

Seeds mixtures consist of permanent grazing mixtures, based on perennial and short-rotation ryegrasses, cocksfoot, tall oat grass (*Arrhenatherum elatius*), meadow fescue, and the three clovers red clover, white clover, and alsike, and two temporary mixtures of either Italian ryegrass, cowgrass, and white clover or short-rotation ryegrass, alsike, cowgrass, and white clover.

A lucerne-cocksfoot-tall oat grass combination has been included to test its suitability under local conditions for providing winter feed in the form of hay and winter grazing. Another special-purpose pasture mixture, made up of short-rotation ryegrass, cocksfoot, and meadow fescue and clovers, is being tried, with and without nitrogenous fertilisers, as a provider of autumn-saved grass for late winter and early spring feeding. The temporary pastures have been included for grazing, hay, and the conditioning of the ground for subsequent permanent pastures sowing, with or without intervening crops.

Besides attempting to determine advisable methods of establishing pastures on cultivated ground, this series of experiments also includes establishment treatments applied to natural tussock cover. The methods of seeding used in the 1953 pilot trials have been again employed. Grass and clover mixtures have been drilled with grassland tips direct into tussock and other fields have been subsurface drilled with clover mixtures (Montgomery red clover, alsike, and white clover) to build up soil fertility under clover grazings. Subsequently attempts will be made to establish grasses in these clover areas, either with grassland tips, by surface sowing, or after cultivation.

As certain fields go through their crop rotations crop varieties trials are being incorporated. The establishment of pastures under cover crops of oats, rape, and turnips is also under investigation.

There were originally 20 fields in this series, but this number has been increased to 25 with spring sowings in 1955. Though many of the treatments and practices incorporated in this trial are already being used by high country runholders, some useful information is expected to accrue regarding the persistency, yields, and seasonal growth habits of various pasture swards. Herbage production cuts are being taken and dry-matter productions determined. Botanical analysis of herbage samples will indicate any changes in sward composition as the trials progress. All fields are grazed and sheep/day grazing records kept.

Species and Strains Trials

The foregoing trials are concerned mainly with pasture sowing and establishment of seeds mixtures and fertiliser responses. In the meantime the search continues for grass and legume species capable of being readily established in tussock grassland swards and of improving the ground cover and grazing potentialities of such areas.

Consequently, two other trials were sown (November 1954) and grassland tip drilling was employed to introduce 17 species of grasses and 9 species of legumes into tussock sward. The grasses, which were sown alone and with white clover, consisted of *Agropyron intermedium*, *A. kirki*, and *A. trachycaulum*; *Bromus inermis*, *B. marginatus*, and *B. popovi*; two fescues, *Festuca arundinacea* and *F. maieri*, and the more commonly known species cocksfoot, *Danthonia pilosa*, timothy, *Phalaris tuberosa*, and perennial and short-rotation ryegrasses. *Dactylis woronowi*, which closely resembles cocksfoot, was also sown.

The legumes included five strains of lucerne (*Medicago sativa*) and one of creeping lucerne (*M. glutinosa*), two strains of strawberry clover (including Palestine), alsike, reversed clover, *Lotus uliginosus* (*major*), subterranean clover (Mt. Barker), Montgomery red clover, and white clover.

Seed was sown with phosphate and molybdenum and all of the lucernes were inoculated. Half of the area of each trial is enclosed and under controlled grazing and half is subject to unrestricted grazing.

Preliminary Results

Most of the experiments at Broken River are planned on a long-term basis and it will be several years before conclusive results are available. Already, however, there are some interesting features.

The original pilot trial demonstrated that subsurface introduction of seed with grassland tips gave better and more even establishment and better early growth during the first two seasons than did broadcast sowings. An outstanding response to molybdenum was another feature of this trial. (Detailed results were given in the article "High Country Tussock Grassland Improvement in Canterbury" in the December 1955 issue of the "Journal".)

On the manurial section of this trial no initial differences were apparent in the 1½cwt., 3cwt., or 6cwt. superphosphate plots, but differences in favour of the two heavier rates have become apparent toward the end of the second season. As in the method of sowing section, plots receiving molybdenum in addition to phosphate gained initially an outstanding advantage.

In the comprehensive method of establishment series begun in October 1954 pastures sown after winter fallow produced during their first 6 months 31 per cent. more dry matter per acre than those sown without prior fallowing. Though with winter fallowing there is risk of wind erosion from strong nor'westers, the danger is probably not as great as with a summer fallow except in very exposed localities. Because of the wind erosion problem it is inadvisable to topwork the fallowed furrows until just before sowing in spring.

The 3½in. broadcast coulter drillings were affected by inadequate consolidation. The strike was somewhat uneven and slow in comparison with that from 7in. spacings, but the broadcast swards thickened up considerably within the first growing season and sheep appeared to give them preferential grazing.

Both temporary and permanent pastures sown down under cover of oats established as well as those sown without the cereal cover, though as the beginning of grazing had to be delayed until the cover crop was harvested (for chaff) the initial grazing on these areas was available some 4 to 5 weeks later than on the non-cover crop areas. Pasture sown under the cover crop appeared to enter the winter in better heart than that sown without it. The covering oat crop yielded 25cwt. of chaff per acre.

Though all the pastures were sown down with nitrogenous fertiliser (1cwt. per acre of ammonium nitrate-lime) in addition to 2cwt. of superphosphate, 15cwt. of lime, and 2½oz. of sodium molybdate, the natural deficiency of available nitrogen in high country soils has been shown by the development of general unthriftiness in young ryegrass swards about 2½ months after

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sowing. This was especially so with the higher-fertility-demanding Italian and short-rotation ryegrasses. A trial was laid down when the deficiency symptoms appeared—brown and reddish purple discoloration of ryegrass leaves and poor growth—and on plots receiving nitrogenous fertiliser there was a rapid return to normal leaf colour and vigorous growth within 6 days of the application.

The value of nitrogenous fertilisers was also shown in the oat crops. One receiving nitrogen yielded nearly 40 per cent. higher than one without nitrogen. Where 1cwt. per acre of ammonium nitrate-lime was applied on 24 March to a part of a field closed for autumn-saved grass, production was increased by 24 per cent. in a cut taken on 12 April, though whether this additional growth will withstand the rigours of a local winter and retain its usefulness for late winter grazing has yet to be proved.

Of the seeds mixtures sown in cultivated ground the best production to date has been attained with the lucerne-cocksfoot-tall oat grass mixture. Temporary pastures have also yielded well, especially those based on Italian ryegrass and cowgrass. As was expected the slower-establishing perennial ryegrass swards gave somewhat lower production in the initial stages, but were gaining in the late-season cut and appeared to enter the first winter in better heart than the temporary swards.

The average production of all sown pastures up to the end of October 1955 was 2787lb. of dry matter per acre and the average grazing figures were 802 sheep/days per acre. Maximum production and grazing were obtained from a special-purpose pasture based on short-rotation ryegrass, cocksfoot, and tall oat grass with the three clovers—4106lb. of dry matter and 979 sheep/days per acre.

In view of the soil type and altitude and of the fact that the natural vegetation before improvement carries only about 1 sheep to 5 acres initial production from sown pastures is very promising.

Clover establishment and initial growth on subsurface drilled and surface broadcast fields has been much slower than where seed was sown down in cultivated ground and, as in all grassland tip work to date, the strike of grass species is conspicuous only in bare ground or open-cover patches throughout the tussock swards. Lucerne (3lb. per acre) in one of the grassland tip sowings has established very well, but not as well in the four strains plots of the species and strains trials.

In these last trials most of the other legumes apart from *Lotus uliginosus* (*major*) and possibly reversed clover have done well. Best establishment has resulted with Montgomery red clover, alsike, and subterranean and white clovers, with strawberry clover also present in one plot.

Establishment of grass species amid the natural cover has been uncertain and slow. Definite results as to the success or otherwise of the sown species will not be very apparent before the second season, though by the end of April 1955 there was some evidence of seedlings of *Agropyron kirki* and *A. trachycaulum*, cocksfoot, *Dactylis woronowi*, and tall oat grass and odd plants of *Bromus marginatus* and *B. popovi*, tall fescue, and perennial ryegrass.

Further Trials

The Broken River trial area is but one phase of tussock grassland research work being carried out in the high country of the South Island. To date trials there have been confined to ploughable country, but as time and staffing permit the scope and extent of experimental work is being expanded.

Additional trials laid down in 1955 included rates of fertiliser and time of application experiments, trace element trials, and seeds mixtures and clover inoculation trials. The scope of sowing and fertiliser treatments will also be extended to the adjacent terrace and hill slopes of both sunny and shady aspects.

☆

Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during October as follows:—

1XH Hamilton, 12.33 p.m.

8 October—"Preparation for Shearing", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

15 October—"Weed Control", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

29 October—"Fruit Tree Troubles", by W. Brandenburg, Horticultural Instructor, Department of Agriculture, Hamilton.

1YZ Rotorua, 7.15 p.m.

11 October—"Weed Control", by S. R. Hewitt, Instructor in Agriculture, Department of Agriculture, Whakatane.

25 October—Young Farmers' Club talk, organised by Western Bay of Plenty district committee.

2XA Wanganui, 8. p.m.

4 October—"For the Country Woman", by Mary Macdonald.

11 October—"The Radio Vet.", by S. Jamieson, Veterinarian, Department of Agriculture, Wanganui.

18 October—"Management of Growing Stock", by B. J. Russell, Poultry Instructor, Department of Agriculture, Wanganui.

25 October—"Investigations with Fertilisers and Trace Elements", by A. K. Booth, Instructor in Agriculture, Department of Agriculture, Wanganui.

2ZA Palmerston North, 12.33 p.m.

1 October—"Hydatid Control", by J. R. Heawood, Livestock Instructor, Department of Agriculture, Palmerston North.

8 October—"Baled Silage", by F. M. Hopkins, Instructor in Agriculture, Department of Agriculture, Levin.

15 October—"Use of Sawdust in Horticulture", by G. N. Paulin, Horticultural Inspector, Department of Agriculture, Palmerston North.

29 October—"Flight Strips for Aerial Topdressing", by E. A. Madden, Agrostologist, Department of Agriculture, Palmerston North.

2YZ Napier, 7.10 p.m.

9 October—"Transport of Animals to Freezing Works", by J. H. Thornton, Supervising Meat Inspector, Department of Agriculture, Hastings.

23 October—"Feeding and Management of Perching Pullets", by H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings.

3YA Christchurch, 12.20 p.m.

1 October—"The Selwyn Foothills Survey", by R. C. Stuart, Agricultural Economist, Department of Agriculture, Christchurch.

15 October—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Ranglora.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8 p.m. (Northland livestock report and "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 8 p.m. ("News for the Farmer").

1YA Auckland, Mondays at 12.33 p.m., Tuesdays, Wednesdays, Thursdays, Fridays, 7.45 p.m., and Saturdays at 6 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Tuesdays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

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Preserving Eggs from Household Flocks

By M. E. WHITE,
Poultry Instructor, Department of Agriculture, Levin

EGGS are one of the best foods available, being very high in protein content, essential minerals, and vitamins A and D. They are a protective food, helpful in building up resistance to disease, and—an important consideration to the diet-conscious woman—with all their health-giving qualities they are non-fattening. Doctors and dieticians recommend that every adult and child should eat an egg daily, and with the large number of backyard poultry runs in New Zealand this should not be difficult for at least the great majority of the population.

ONE of the best features of eggs is that as a food they can be very quickly prepared. In a few minutes they can be made into a most satisfying, delicious, and health-giving meal. The housewife with a few fowls in her backyard can with very little time or trouble preserve her surplus eggs, and her family will be able to enjoy plenty of eggs all the year round.

Many people who keep a few fowls for their own use probably find that they have a surplus of eggs during spring and early summer, when egg production is at its peak, and find it very easy to sell any eggs over and above their own requirements. However, if low spring prices are taken into consideration, they would possibly find it more economical to preserve any surplus eggs they have. This would give housewives a ready supply of eggs during winter, when their own flocks are not laying so well.

Eggs Must be Selected Carefully

There are several satisfactory methods of preserving eggs for home needs, but whatever method is used, if the preserved eggs are to be of a consistently high quality, care must be taken in selecting the eggs to be used. They should be fresh, though allowed to cool completely first; possibly 24 hours is the ideal age. It is desirable to use infertile eggs only. This usually presents no difficulties because an average household poultry keeper does not need a male bird in the pen at any time. The shells should be clean and should not be washed before using. They should also be sound, firm, smooth, and free of hair cracks.

Perhaps the oldest known method of preserving eggs and probably the cheapest is to immerse them in limewater. Though the shells are hardened by lime deposits, the eggs do not deteriorate rapidly when removed from the mixture.

The solution can be made by mixing 2lb. of freshly slaked lime with 5 gallons of water, the mixture being stirred twice daily for 3 days, when a milky fluid is formed. One pound of common salt is then added. After the mixture has been allowed to stand for 5 hours to settle, the liquid is poured off into small casks or china vessels and is then ready for the eggs.

Water-glass Method

An alternative method, and the one most generally followed, is the water-glass method. In this method the eggs are immersed in a solution of silicate of soda (known as water-glass) and water. The results are equal to those obtained with limewater and the shells are not as rough when taken out of the solution. Water-glass is usually sold in concentrated solution, and a mixture of 1lb. of water-glass to 2 gallons of water will be found satisfactory. A stronger solution may affect the flavour of the eggs and will also cause them to float. The desirable strength is that which will cause fresh eggs to sink slowly in the solution.

Good-quality, sound-shelled eggs are essential if egg preserving is to be satisfactory.

Small wooden kegs, oil drums, or petrol tins are commonly used as containers for preserved eggs and all are suitable for this purpose, but the vessels should be thoroughly clean and free of any odour; otherwise the eggs will quickly become tainted. Fill the vessels with the solution to about one-quarter capacity, and place the eggs in the liquid until they reach about 3in. from the top. The eggs must be entirely covered with the solution, and to ensure they are not exposed to the air it is a good plan to allow a piece of board slightly smaller than the opening to float in the liquid.

The preserved eggs should be kept in a room where the temperature is not excessively high nor subject to sudden fluctuations. If these instructions are carried out carefully success by either of the above two methods should be assured.

Some proprietary preparations are available for smearing on eggs, which are then stored in cases in a room in which an even temperature is maintained. This point is very important, as eggs preserved by this method are much more readily affected by temperature changes; they will also taint quickly and should not be stored near any strong-smelling foods or liquids. The cases should have some openings in the sides to allow the air to circulate between the eggs.

[Niederer

Whatever the vessel used for egg preserving, it must be thoroughly clean and free from odour.

Selection and Care of Leather Shoes

By MAUD B. STRAIN,
Field Officer in Rural Sociology,
Department of Agriculture, Dunedin

A comfortable type of walking shoe. The inside line (A) is straight, the greatest length is over the big and second toes, there is ample width for free movement of the toes, the back fits snugly round the heel of the foot, and the leather heels are the right height for comfort and health.

ONE of the most important purchases one makes is that of a pair of shoes, because they affect one's ensemble, posture, health, and spirits. Also they are not inexpensive. It is worth while knowing what to look for in a good pair of shoes and with this knowledge to spend some time in the selection of footwear that will be at once well fitting and suitable.

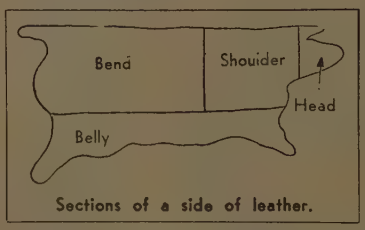
WOVEN fabrics such as satin, crepe, velvet, lace, and metallic cloth are used for evening shoes; gabardine, linen, nylon mesh, canvas, and plastic have their uses for daytime wear, but the chief material that is used in footwear for any and every occasion, for men, women, and children, is leather. Leather is skin preserved in such a way that the properties which it had when it was still alive are made permanent. Because it is at once firm, resilient, and extremely durable and because also of its unique ability to "breathe", leather has no equal for boots and shoes. The skins of many animals including reptiles and birds are used for making leather, but by far the greatest amount comes from cattle, sheep, and goats. The heavier, thicker skins of the larger animals are known as hides, and skins are from the younger, smaller, or lighter-weight animals.

Tanning

Skins and hides that are used for shoes are treated to prevent decomposition. This process, tanning, is carried out by the use of tan liquor (made, for vegetable tannage, from the bark, leaves, and seeds of various trees —an infusion made from the bark of wattle trees is highly satisfactory—or, for chrome tannage, by the use of chromium salts). Vegetable tannage is a lengthy process taking weeks or even months to complete, but chrome tannage can be done in a matter of hours. For some purposes a combination of the two methods is most suitable.

Shoe Leathers

Leather used in making shoes is of two kinds—bottom or sole leather and upper leather. Bottom leather is used for the outsole, insole, and welt; the counter (the stiffener which keeps the heel end of the shoe from losing its shape) is generally fibre, not leather, and the other parts including the vamp, quarters, toe-cap, and tongue are cut from upper leather. Sole leather is made from heavy cattle hides and the best soles are cut from the bend portion, where the leather is close fibred and fine.



Sections of a side of leather.

Various other substitute soling materials are in use, as, for example, a rubber outersole with an all leather middle sole. Synthetic materials are also used and the better synthetics show a greater resistance to wear and water penetration. They do, however, have a few disadvantages; they conduct heat and cold better than leather and so are hotter in summer and colder in winter. They do not carry off perspiration as well as leather, the grip of the sole is less satisfactory on a greasy or muddy surface, and they tend to spread in wear, causing distortion of the shoes.

Upper leather comes from a wide variety of sources, mostly from cattle, calves, goats, sheep, and horses, but skins from kangaroos, pigs, and reptiles are sometimes used.

Cow-hide makes leather of good thickness and body, but the best sole leather comes from thick, heavy ox-hide. The uppers of heavy boots and work shoes are made from cow-hide, oiled to make it resistant to moisture and waxed to make it specially resistant to hard wear. Kid made from the skins of full-grown goats is an excellent upper leather, having a fine, clear grain and being close textured. Glace kid is one of the most popular upper leathers; it is soft and pliable, qualities that are appreciated by people with sensitive, tender feet.

Sheepskins are used extensively for making leather but not so much for shoe uppers, because though very soft, sheepskin stretches easily and is not durable. It is used extensively for lining shoes. Suede and nubuck are names given to finishes on leather. Suede is the velvet finish produced on the flesh side of goat, sheep, calf, or ox hides. Nubuck is leather finished on the hair side with an emery wheel, which takes off part of the grain surface, leaving a soft finish

with a much less pronounced nap than suede. Patent leather is made by coating leather, usually colt or goat hides or cow-hides, with special varnishes or enamels. White shoe leather is largely chrome-tanned leather; this requires a white pigment finish to produce a really white appearance. The bluish green seen on white shoes that have been in use for some time is due to the pigment wearing off and exposing the chrome-tanned leather. Crocodile and lizard skins are durable, but the supply is extremely limited because of the difficulty in getting them.

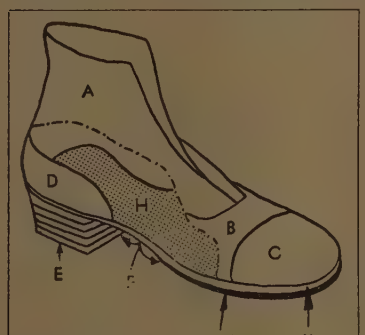
Waxed Leathers

Under the heading of waxed leathers come the comparatively new aniline calf shoes. The leather for these is produced somewhat differently from the usual method where uniformity of colour is obtained by levelling off the varying shades of colour in a skin by the use of pigments. This obscures the natural grain of the leather. Aniline calf is a vegetable-tanned leather which has had no pigment applied. It is treated with dyestuffs only and the finished shoes are dressed with a wax polish.

Shoe Construction

Most shoes consist of an upper, an insole, and an outsole, and the way the upper is fastened to the insole and the way the outsole is fastened to the upper and insole have an important bearing on the general serviceability and repairability of the shoe.

The sturdiest type and that usual for men's shoes is the welt shoe. In this the upper is fastened to an insole rib with staples, after which a strip of leather, called welting, is sewn to the insole rib; this fastens welt, upper, and insole together. The outsole is fastened to the welting by a seam which is usually visible near the outside edge of the welting or the bottom of the outsole. A variation of this method cements the outsole to the joined upper, insole, and welting; this construction is frequently used for women's shoes.



Parts of a boot. A—Quarter. B—Vamp. C—Toe-cap. D—Counter. E—Top lift. F—Shank. G—Outsole. H—Insole. K—Welt.

A man's welted shoe, showing the line of stitching joining the upper to the sole. A lace-up shoe allows for adjustment to maintain a firm fitting over the instep.

In another method the upper is fastened to a flat insole with tacks and the outsole is chain-stitched on to this. The resulting shoe is usually lighter and cheaper than the welt shoe, but requires an insole lining to protect the foot from the clinched tacks and stitches in the insole.

A further method, which produces a shoe in serviceability second only to the welt shoe, does not allow staples to come through the insole and uses lockstitch for sewing on the insole.

The stitchdown process, in which welt, upper, lining, midsole, and outsole are fastened together with stitching on the outside of the shoe, produces a shoe which on casual inspection resembles a welt shoe. This method is used principally for infants' shoes and for some sandals.

Most heels are made from leather, rubber, or wood. Leather heels are built up in layers called "lifts". The top lift is the layer that comes in contact with the ground and is generally good, firm leather, but the other lifts may be inferior leather or leather substitutes. The pitch of the heel is the angle at which it is attached to the shoe. Rubber heels lessen the jar of walking and last longer than leather, but are slippery on smooth, wet surfaces. Wood heels are covered with leather, plastic, or fabric and are provided with a leather or rubber top lift. This in its various styles and heights is the usual type of heel for women's dress shoes.

Lasts

In order that a shoe may be made the required shape it is necessary to build it up gradually on a mould, this mould being called a last. Lasts are built according to a scale of standard measurements for the ball, waist, instep, and heel, based on the average proportions for normal feet. Sometimes shoes are made on combination lasts in which the fore part of the shoe may be made to standards that are one-half size larger than those for the heel end of the shoe. Lasts differ in length, width, and shape to fit the many differently formed human feet. Different lasts are required for the differing types and styles of shoes and heights of heels.

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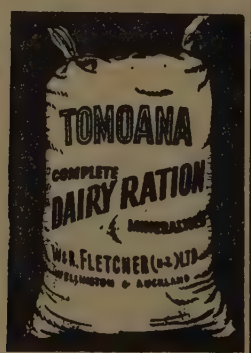

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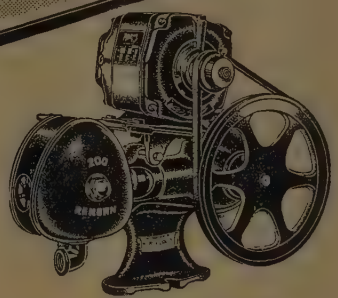

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Sizes and Fittings

The size of the shoe depends on the length of the foot. Between one size and the next the usual difference in length is ⅓in. As the length of the foot increases it is assumed that the girth (distance across the widest part of the foot) increases also; thus with shoes as the size is larger so is the girth. However, feet vary, some are long and narrow and some are short and broad, and to allow for these differences shoes are made not only with different girths for different lengths but also with different girths for the same length. These variations in girth for the same length are known as fittings and are usually designated by a letter of the alphabet, as, for example, B fittings. Fittings range mostly from AA for narrow feet to D for broad feet. American scale sizes are not the same as those used in this country. American are stamped 1½ sizes up; thus a New Zealand size 4 shoe corresponds most nearly with a 5½ American, but the American size is always 1/12in. shorter than the corresponding New Zealand or English size.

For foot comfort it is essential that the last should conform to the shape of the foot. The fitting should be such

Parts of the foot. A—Ball. B—Waist. C—Instep. D—Heel. E—Ankle.

that the shoe needs no "breaking in"; the foot is more yielding than the shoe and it is the foot that is broken in. The upper portion of the foot is soft, yields easily to pressure, and quickly shows the results of it. The toes in particular grow corns where the shoes continually press against them, and a bunion on the big toe joint is caused by pointed-toe shoes constantly forcing the big toes away from their natural, straightforward position.

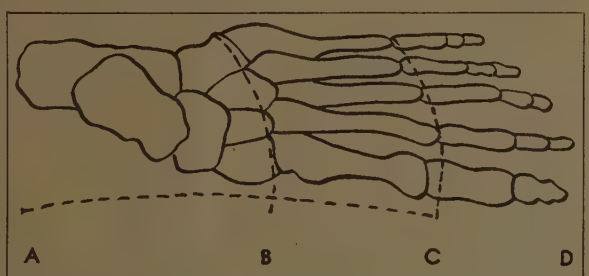
Unusual Fittings

Those who have difficulty in obtaining shoes in the required size and fitting for unusually long, short, narrow, or wide feet would be well advised to make known their shoe requirements well in advance at a shop where they and their shoe problems are known. Shoes of their particular fitting can then be ordered with the firm's bulk order, and the necessity for spending much time searching for an unusual fitting will be obviated.

The effect on the bones of the foot of an incorrectly shaped, poorly fitting shoe. Left—The normal position of the bones. Right—The effects of a shoe that is too narrow, too short, and curving toward the outside edge.

Shoe Selection

The service to be required of a pair of shoes is an important factor when they are being selected and shoes should be reserved for the use for which they were bought. To be comfortable, safe, durable, and attractive shoes for everyday wear must conform to the natural shape of the feet and protect them. They must also provide a firm foundation for the body. Shoes of correct shape are broad and round at the toe and straight along the inner edge. A pair of normal feet placed together touch at the heels and also from just below the big joints of the big toes up to the ends of these toes. The inner edges of the soles of a a pair of properly made shoes do likewise; the more the edges diverge or curve toward the outside of the shoe, the more unnatural is the shoe's shape and the greater the wearer's discomfort. Persistent wearing of such shoes is almost sure to cause enlarged joints and bunions.



Skeleton structure of the foot, showing bones and arches. A-C: Longitudinal arch. A-B: Tarsus. B: Transverse arch. B-C: Metatarsus. C: Metatarsal heads. C-D: Phalanges. The longitudinal arch is the space between the two places where the sole of the foot makes contact with the floor, that is, from the base of the heel to that part on the ball of the foot where the bones of the toes form a joint with the bones of the instep; the second or transverse arch is across the instep from the inner margin, which does not make contact with the floor, to the outer margin, which does.

Everyday shoes need soles that are moderately thick to protect the feet on sharp and uneven surfaces and from water and mud. Moreover such soles wear longer. Heels that taper only a little are best for everyday shoes, and heels that slant too far forward cannot hold the body in proper posture. Heels that are too high, too narrow, or that slant forward too much frequently cause weakened ankles and an insecure balance in the wearer when walking and these in turn cause strained muscles and twisted ankles. High heels push the feet too far forward in the shoes and if persistently worn will ultimately cause corns. A medium heel with a sufficiently big area to feel firm to the wearer when standing is ideal for those who have to do much standing or walking.

Those buying shoes should have the feet measured for size while they are standing. This should give the correct length and girth, but as well as this the shape of the shoe (last) must be the same shape as the foot. Correctly fitted shoes should be comfortable from the start and should permit standing, walking, and quick turning in comfort. Once an entirely comfortable last has been found that particu-

lar last, size, and fitting should be asked for when shoes are bought again. The tips of the toes should never touch the end of the shoe, and there should be no pressure on the toes from a toe-cap of insufficient height. The broadest part should be at the end of the little toe. The big joint of the big toe should come just at the rounding-in of the sole on the inside edge near the instep. When the wearer stands and raises the heel the bend in the sole should come directly under the big toe joint. The counter (the stiffened portion forming the heel seat) should hold the heel of the foot snugly in the heel seat of the shoe and not allow it to slip up and down.

Court shoes should fit snugly round the instep but should not be tight enough to cut into the front of the instep. They should not require any alteration such as heel lifts, inner soles, or stretching of any area to make them comfortable. In a lace-up shoe the two lacing edges should not meet or overlap; there should be a slight gap so that the shoe can be laced tightly enough to hold the foot firmly but not sufficient gap to permit the laces to cut into the foot.

Sandals and play shoes are good for the purposes for which they are intended, but should not be worn constantly, because they allow the feet to spread and lose their shape.

Care of Shoes

Keep shoes in shape by walking with the toes straight ahead. Have the heels repaired as soon as they begin to wear down. Perspiration de-tans leather, making it hard and destroying its flexibility. It is advisable to have two pairs of shoes in regular use and to wear them on alternate days so that each pair may air properly between wearings. Allowing them to dry on shoe trees keeps them in shape and prevents permanent creases forming where perspiration tends to gather and cause the leather to crack.

For leather street shoes a good polish regularly applied and well brushed in should be sufficient to keep the leather in good condition. Light-coloured leather shoes benefit by an occasional clean with saddle soap, a specially prepared compound of beeswax, castor oil, and neutral soap, which cleans the leather without darkening it. This followed by treatment with a good shoe polish restores the glossy surface.

White Leathers

White leathers vary considerably, depending on the type of leather and method of tannage. Information as to the correct method of cleaning and maintaining the white colour should be sought, and the appropriate dressing bought when the shoes are bought.

Patent Leather

The biggest problem in the use of patent leather is its tendency to crack and break. Therefore treatments aim at keeping it soft and supple, but the methods suggested for doing this vary. One manufacturer suggests that petroleum jelly be used to keep the surface pliable. Patent leather has a varnish surface which does not absorb anything rubbed on it; however, it must be kept shiny, and the use of a lubricant is thought preferable to something which might further dry the surface. The petroleum jelly should be rubbed liberally over the leather and the shoes allowed to stand in a slightly warm place for a day or so before they are worn. The petroleum jelly is then wiped off and the shoes polished with a soft cloth. Special patent leather creams have been made which slightly soften the varnish finish and allow it to absorb oil present in the cream. It is claimed that patent leather treated regularly with a cream dressing of this type is unlikely to crack. Before petroleum jelly or cream is applied any dirt should be wiped off with mild soap and warm water.

An alternative method of treatment is based on the idea that the reason for patent leather cracking is sudden change of temperature, as when the wearer goes from a warm room to a freezing outside temperature, making the surface of the leather brittle, and that the best treatment is to avoid these sudden changes. Apart from this all that is necessary is to wipe off finger marks and other dirt with a damp cloth and a little hand soap and then wipe the shoes with a cloth wrung out of clean water and polish them with a dry cloth. Manufacturers know best how their products should be cared for, and a buyer would be well advised when buying patent leather shoes to inquire how they should be cleaned and to follow the instructions given.

Under Wet Conditions

Shoes that are properly protected from rain and mud wear much better, because constant soaking of shoes dries out the oils, making leather stiff and uncomfortable and causing it to wear out quickly. Wet leather is soft and readily stretches out of shape, and stitches cut through it easily. Wet shoes must be dried carefully away from heat. When dried too fast and without care shoes shrink and become hard, tight, and out of shape; also the sole becomes brittle and cracks. Shoes should be dried in the following way: First wash off all mud and grit with tepid water. Heavy boots and shoes should be treated with dubbin applied to the wet leather; as the water dries out fats enter the structure of the leather. A further application may be made when the leather is dry, but this will affect the surface only.

Street shoes should be treated with castor oil; if a little of this is applied on a piece of soft cloth lightly and evenly and well rubbed in, the shoes will take a good shine when dry. An excessive amount will cause difficulty in polishing later. Straighten the shoes to their proper shape, stuff them with crumpled paper to facilitate drying, and leave them to dry out at room temperature. They should not be worn until they are thoroughly dry and they should be polished as soon as they are dry.

Work shoes and boots can be made to wear longer by the rational use of suitable oils and greases whenever the leather begins to harden, or dry, or fails to turn water well. The best materials are neats'-foot oil, castor oil, tallow, or wool grease. The soles and uppers should be brushed to remove all dust and dirt and the shoes should be warmed slightly. Warm the oil slightly also, apply it with a swab of wool or flannel, and rub it well into the leather, paying particular attention to the join between the sole and the upper. Allow the oiled shoes to dry away from any direct source of heat, but in a warm room.

Care of Pinking Shears

HOME sewers who own pinking shears find they provide a neat, quick way of finishing off seams in bulky fabrics and in those that do not fray. But is it always realised that they are a precision tool and should be treated as such?

The blades should be brushed lightly before and after each use to remove any particles of lint or dust. Both these are abrasives and can cause trouble in the adjustment which meshes the teeth perfectly. A light film of sewing machine oil over the blades keeps them clean and protects them while the shears are not in use, but it should be wiped off carefully from the blades and teeth before the shears are used again. A drop of machine oil placed between the blades at the pivot point helps to preserve the original adjustment and keeps the shears running smoothly.

Sharpening and adjusting of the shears are work for a specialist and should not be attempted at home.

—*MAUD B. STRAIN,*
Field Officer in Rural Sociology, Department of Agriculture, Dunedin

The Soil of the Flower Garden

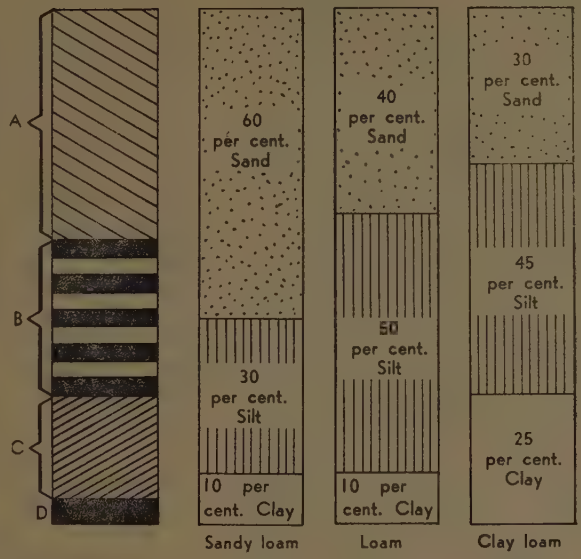
FREQUENTLY a gardener looks on the soil only as a medium in which to grow his plants. But soil is not just an inert material; it is a complex mixture of non-living and living particles constantly changing in composition. An understanding of the basic features of a soil will assist the gardener in growing plants in the most efficient manner, and in this first of three articles on this subject J. P. Salinger, Horticulturist, Department of Agriculture, Wellington, describes the essential features of all soils. The garden work notes are by Elspeth Gray, Horticultural Instructor, Department of Agriculture, Auckland.

TWO terms that constantly recur in all discussions on gardening are topsoil and subsoil. Topsoil is the top 9in. or so of cultivated soil which the gardener digs, manures, and cultivates and subsoil is the underlying layers of soil which are undisturbed or infrequently cultivated and which are more similar to the original material from which the soil was formed.

Whether reference is made to topsoil or subsoil the same basic features apply to both. A handful of soil is composed of the following constituents:—

1. The inorganic particles arising from the parent material from which the soil was derived.
2. Organic materials. These are decaying or decayed particles of vegetable or animal matter.
3. Soil air: There is always air in the soil, as the particles never fit closely together and the roots of plants and soil organisms are constantly breathing.
4. Soil water: This is always present and may come from underground or from rain which falls on the surface.
5. Living organisms: The soil is full of living organisms, ranging from microscopic bacteria, fungi, and other organisms to harmful and useful insects and worms.

Each of these constituents will be discussed separately, though in the soil they are all closely combined.



▲ Left—The essential features of all soils. The proportion of each constituent varies with the soil and weather. A—Mineral particles. B—Water. C—Air. D—Organic matter and soil organisms. Right—The three diagrams show the relative proportions of mineral particles in three types of soils.

The Inorganic Particles

The inorganic particles are derived from the action mainly of the climate on the underlying geological layers. The size and proportions of inorganic particles will determine the **texture** of the soil. Clay particles are minute and sand particles in proportion are very large.

Soil Types

Soil scientists have classified the soil according to the proportion of particles, and each type of soil has a characteristic behaviour. The type can be determined quite simply by the gardener by picking up a small amount of moist soil and squeezing it between the thumb and first finger. Naturally these soil types grade into each other gradually. The types of soil are now described with their typical characteristics and how they feel when pressed and rubbed between the fingers.

Sand

Sand is loose and single grained; the individual grains can be readily seen and felt. It usually drains freely and needs adequate manure and water to be maintained in a fertile condition. When pressed it will form a shape

▼ The action of digging and adding organic matter has a great effect on the soil. It separates compacted soil particles, increases the organic matter, allows air and water to pass freely into the soil, and stimulates the activity of soil organisms. Sparrow photo.

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which breaks easily under pressure; it feels gritty when rubbed between the fingers.

Sands may vary from gravels and coarse sand which occur where rivers have run swiftly through an area or along the coast to fine sands which gradually grade into the next group. Some recent pumice soils can be considered to be sands.

Sandy Loam

A sandy loam contains a great deal of sand, but also has enough silt and clay to hold together. It is moderately well drained and makes a fertile, easily cultivated soil. When pressed it will hold together, but will break under moderate pressure. It feels slightly gritty when rubbed.

Loam

A loam has a relatively even mixture of different grades of sand, silt, and clay. It is moderately well drained and makes a fertile soil which can be cultivated easily, provided it is not too wet. When pressed it will hold together and break less easily than a sandy loam. It has a smooth, almost velvety feel when rubbed.

The loam which gardeners use for potting is a soil of this type taken from pasture. Through the presence of decomposing grass and roots it possesses more organic matter than similar soil from cultivated ground.

Silt Loam

Particles of silt are intermediate in size between those of sand and clay. This type of soil tends to run together when wet and is not particularly well drained. When pressed it forms a firm lump which will break under further pressure; it feels slightly silky.

Clay Loam and Clay

Clay consists of such small particles that these combine both chemically and physically. These soils are naturally poorly drained and difficult to work when wet. When a clay soil dries out the soil cracks open. It forms a tight lump when pressed which is difficult to break, and when it is rubbed a polished appearance develops on the surface. When properly drained and adequately manured clay soils can be very productive.

Organic Soils

Organic soils have a proportion of organic matter in various stages of decomposition. They include peaty soils and, depending on the natural drainage in the area, they may be well drained or poorly drained. Provided acidity and deficiencies of chemical elements are counteracted, organic soils can be very fertile.

Original Characteristics

Whatever the gardener does to improve the texture of a soil, it will always retain some of its original characteristics. Clay soils always have a closer texture than a sandy loam; a peaty soil will always hold more water than a sandy loam.

Gardeners usually consider soils with a large proportion of sand to be "light soils", because they hold less water, are easy to work, and warm up quickly in spring. On the other hand, clay soils are called "heavy soils", as they hold more water, are more difficult to work, and usually warm up more slowly in spring.

The Chemical Elements in Soils

Depending on the origin of the soil, the inorganic particles possess varying amounts of the chemical elements which are essential for plant growth. A soil derived from limestone will possess a high proportion of calcium; some of the recent pumice soils are deficient in potassium. Usually soils in their natural condition do not possess sufficient chemical elements to promote good plant growth continuously under cultivation. These have to be added by manuring with organic matter and applying lime and fertilisers. Occasionally some soils have a high proportion of the necessary chemical elements, but for various reasons these may not be available to plants. This aspect will be considered in the third article, when soil fertility is discussed.

Organic Materials

Organic materials are the decaying and decayed portions of plants and soil animals. When thoroughly decayed, organic matter becomes a dark brown material known as humus. The compost which a gardener makes is still organic matter; it is not strictly humus. Organic matter plays a very important part in the make-up of the soil. Soils low in organic matter are usually unproductive and of poor structure. Subsoils, for instance, normally possess very little organic matter.

Organic matter has a physical effect on the mineral particles, assisting them to bind together to form crumbs of soil. In a clay soil the small size of the clay particles prevents air and water penetrating easily, and these particles combined with organic matter form crumbs of soil which assist in the penetration of air and water. On a light, sandy soil organic matter helps to retain air and water and so improve the quality of these soils. Organic matter in its crude form has little food value for plants. Plant roots appreciate the air and moisture in the organic matter, but the food content is obtained by the soil organisms acting on the organic matter and making the chemical elements in the soil available to the plant.

In a cultivated soil organic matter is constantly being depleted by the action of the organisms which live in the soil; it is important to maintain the proportion of organic matter in the soil of a flower garden by adding farmyard manure, compost, or even sawdust.

Section cut vertically through a soil provides a soil profile; this shows the topsoil and subsoil. The crumb structure is clearly seen and plant roots have penetrated easily to the subsoil. Air and water can pass freely through this soil and when dug over, it would make a free-working soil.

From a painting depicting the M.V. "Rangitiki" of the New Zealand Shipping Co. Ltd., and the famous "Jervis Bay" in the well-known action of 5th November, 1940.

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No need to extol the men who sailed the ships of the British Merchant Navy during the War. But behind that epic of the sea, another drama was taking place in the boardrooms of the Companies.

For example, between August and December 1940, the New Zealand Shipping Company (and its associate, the Federal Steam Navigation Company) lost by enemy action almost one-fifth of its total fleet. And, clearly, that was not to be the end of the story. What should the Companies do? Ought they to rebuild them—and face the considerable risk of losing the money thus invested; or should they wait until the War was over?

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But the Companies were not deterred. And, although more than half the original fleets had been lost by the time the War ended, a steady succession of new vessels was coming from the shipyards. The continuance of New Zealand's shipping service was thus assured.

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These are either dug in or applied to the soil surface as a mulch. The maintenance and increase of organic matter in a soil are one of the first principles of gardening.

Soil Air

Respiration is a natural function common to all plant parts; they take in oxygen and pass out carbon dioxide; the roots of plants therefore need air as much as the leaves and in fact air is present in all spaces between the soil particles which are not filled with water. In the same way as plants the soil organisms respire and require air. Anything which interferes with the movement of air and gases between the atmosphere and the soil affects both plant growth and the soil organisms. The cultivations which a gardener carries out, such as hoeing and forking over, prevent the surface of the soil from sealing over and allow the exchange of air.

Soil Water

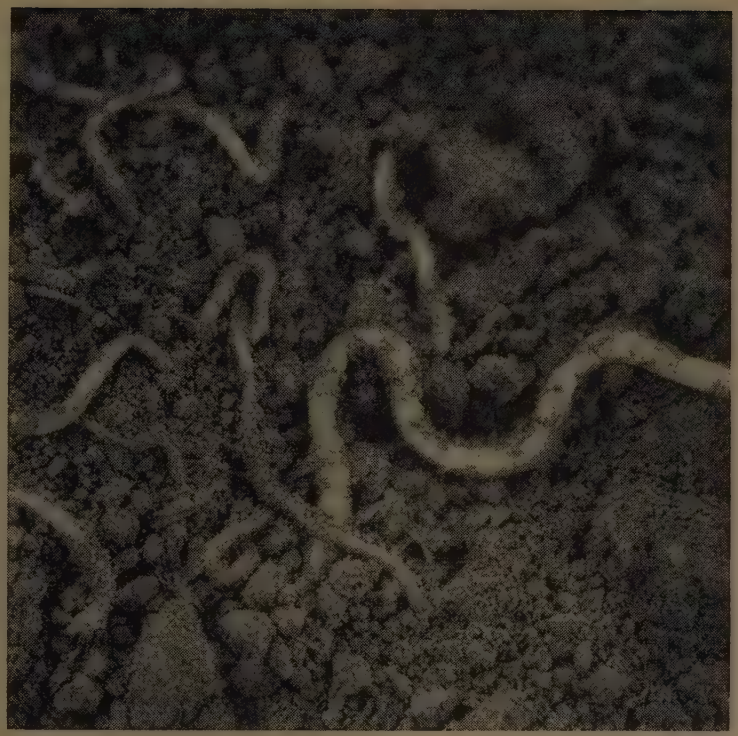
Water is essential for plants, as it often comprises up to 90 per cent. of the plant. In addition, plants can absorb the chemical elements from the soil only in a soluble form. Water is therefore vitally needed both for this purpose and also because plants transpire. In transpiration plants give off water vapour to the air mainly through their leaves and unless sufficient water can be taken up through the roots by the plant, it wilts and eventually dies.

Though a soil may appear to be moist, the water may be held so firmly by the particles of soil that the plant roots can absorb only a small proportion of their requirements. In most parts of New Zealand artificial watering is required in summer and the correct use and application of water for any particular soil can be learnt only by experience.

Over-watering can be harmful, as it may drive out the air in the soil. If water is poured heavily on to the soil, it may seal the surface and create the same condition. Whether a hose and sprinkler or a watering can are used the water should be applied lightly in small droplets which fall gently on the soil and do not seal the surface. Should the surface become sealed, it is essential to break this crust by hoeing.

Alternatively in winter continuous rain or underground water may fill the soil with moisture and again drive out the air; drainage which takes the water quickly away from the upper layers of the soil is then necessary.

Where underground water rises close to the surface it is essential to lead this away by installing drains. These should lead from the section to a sump or storm-water outlet. On steep sections water frequently runs from higher ground or from slopes and banks; this can be drained away by making a shallow channel or installing a drain at the base of the slope. The main feature of water in the soil is that it should be constantly moving, and the soil itself should never be saturated for a long period.



[*Sparrow*

Earthworms are beneficial soil organisms. They digest organic matter and also incorporate it into the soil. Air and water penetrate freely through their burrows.

Soil Organisms

The soil is full of living organisms of all types; there are representatives of both the vegetable and animal kingdoms, but they are different from those with which we are familiar in our daily life. The animals range from earthworms to minute microscopic protozoa, and include both beneficial and harmful insects and eelworms. Basically they are all seeking food, but some are useful to gardens and others are harmful. To a grass-grub it is unimportant whether the gardener wishes to grow ornamental plants or weeds provided they are a source of food for the insect. It may appear to the gardener that harmful insects are determined to destroy his best plants, but it is more than likely that these plants are well fed and succulent and so supply a good source of food; the gardener does not notice the weeds which may be destroyed at the same time.

The vegetable kingdom is represented by fungi and bacteria; many of these are beneficial to the gardener. Some fungi even attack harmful eelworms and certain bacteria are essential for the satisfactory growth of leguminious plants.

To the gardener the greatest value of the soil organisms is their ability to break down organic matter. As a result the chemical elements composing this are made available to the plant in a soluble form. Certain bacteria also have the ability to absorb nitrogen from the air and convert it to soluble forms of nitrogen in the soil.

When soil organisms die other forms will make use of them and in the process provide chemical elements in solution for plants.

The continued cultivation of one type of plant on the same area of soil over a long period will eventually build up organisms harmful to that plant. A change of plants may be better than a change of soil.

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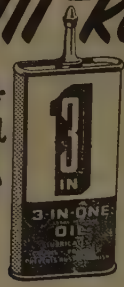

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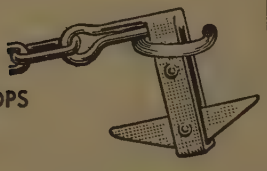

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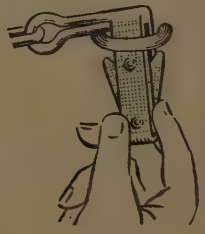

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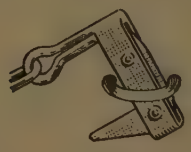

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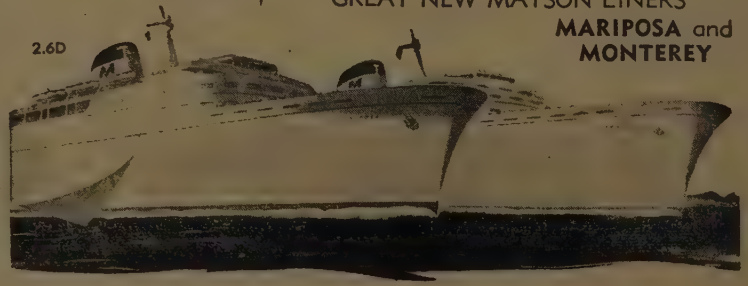


It can now be realised that the soil is a complex world of its own, depending on the relationship between its main features. First, there are the inorganic particles which form the foundation and main structure of the soil. These particles by themselves would be useless to plant growth. By the action of air and water and the substances dissolved from the organic matter chemical elements are made available to plants and soil organisms. The air and water in the soil are essential in many ways for soil organisms and plants. Organic matter holds water in the soil and by providing food for soil organisms allows them to increase in number. Finally, the organisms live their own lives in the soil and would continue to flourish whether valuable plants or weeds were grown.

Almost everything the gardener does in the garden will affect the soil, whether he is digging in manure, pulling out a weed, mowing the lawn, or treading on a bed to pick a flower.

The basic principles of good soil management must be understood if the best is to be obtained from the garden.

These principles can be set out as:—

1. An understanding of the basic nature of the soil; whether for instance it happens to be clay or sandy loam. Does it hold water or is it freely drained? Is it known to be lacking in certain chemical elements which plants need?
2. Maintenance of organic matter. Organic matter is constantly being used up in the soil; it must be maintained or increased when required.
3. The air must pass freely in and out of the soil; lack of air due to excess water or sealing of the soil surface immediately harms plants.
4. Water is essential for all living things, whether plants or animals. Sufficient, but not an excess, must always be available.
5. Maintenance of a healthy soil life. By maintaining the balance and supply of the other four constituents of the soil, a healthy, live soil will result; harmful organisms can be controlled by various means or, in some cases, can be less harmful through changing the plants grown in that area.

Gardening without Soil

From time to time interest has been aroused by articles on gardening without soil. Frequently unjustified claims have been made as to crop yields and freedom from disease.

It is quite possible to grow plants without soil, but they still require a rooting medium, chemical elements, air, and water. Plants are still liable to attack by pests and diseases.

The prime essential for this method of gardening is a thorough understanding of the requirements of the plants being grown. For the home gardener it is still simpler to grow plants in the soil in his own garden, however difficult this may be.

Gardening without soil is a very highly specialised form of horticulture; it is not a short-cut to maximum crops with minimum effort.

Work for October

Seeds that were sown in boxes last month will be ready either for pricking out into boxes or for planting straight into their positions in the garden. If seedlings have germinated thickly, it is important to prick them out before they become too large. Before they are removed from the boxes or seed-beds they should be watered so that the soil will remain attached to the roots when the plants are lifted out.

A trowel should always be used for transplanting and the seedlings handled by the leaves and not the stems. The reason for this is that damaged leaves can be replaced, but the plant cannot grow a new stem. The final planting out should be done on a dull, overcast day if possible to avoid wilting. Hot and windy days should be avoided and the planting done in the late afternoon rather than in the heat of the day. Watering after transplanting will be beneficial. If flower buds are showing when the plants are put out, they should be removed to promote a well-branched plant and to obtain the maximum number of flowers later on.

Mignonette, Virginia and night-scented stock, Shirley poppy, linaria, clarkia, and godetia are annuals that do best when they are sown in positions where they are wanted as bedding plants. They can be sown now where there is room for them.

Hardy annuals that were sown outdoors last month should have germinated and be growing quite well by now. As soon as they are big enough to recognise they should be thinned out to 3in. to 4in. apart each way, and later thinned again to up to 12in. apart, depending on the growth habit. The plants from the first thinning, if handled carefully, may be used for transplanting into another position.

Chrysanthemums

Chrysanthemums are generally planted out during October in most districts. They should be in a sunny, well-drained situation and have some protection from the prevailing wind. The border should have been prepared or at least dug over as soon as the old stools were removed. Chrysanthemums should be planted firmly and spaced 18in. apart if they are being grown in a separate border. In a perennial border it is best to set out three or four plants of one variety 15in. to 18in. apart, in a clump, as more colour is obtained this way than if they are set out as single specimens. When the young plants are about 8in. high the tips should be pinched out to encourage the formation of sturdy, branching plants. If they are allowed to grow naturally, they are liable to be tall and straggly and flowering is erratic. Chrysanthemums should, of course, be staked, with the ties attached firmly to the supports and loosely encircling the plants.

Dahlias

In all but the coldest districts dahlias may be planted out in October. Where late frosts are likely to occur it is advisable to keep the plants covered for a few more weeks, gradually hardening them off by leaving them out in all but the worst weather. For the home gardener it is usually wiser to plant according to the weather and soil conditions than by the calendar.

The beds for the dahlias should have been dug over in autumn and given, where possible, a good dressing

[*Photo News*

This handful of soil shows a good textured loam; this is a fertile soil with the mineral and organic matter particles well mixed.

of farmyard manure. In spring when the ground is being prepared for planting a dressing of lime and bone-dust may be worked into the soil. The dwarf varieties can be planted 18in. to 2ft. apart, the medium ones 2ft. to 2½ft., and the strong growers 2½ft. to 3ft. apart. Where there is sufficient space care should be taken to avoid overcrowding, but in a smaller bed or with a large number of tubers planting distances could be reduced by as much as 6in. The stakes should be placed when the dahlias are planted and tying attended to regularly. Watering with liquid manure may be advisable during dry weather and a light mulch of stable manure or lawn clippings will help to conserve the moisture in the soil.

Gladiolus

Further plantings of gladiolus corms may be made this month. Dusting the corms with a DDT dust before planting will be necessary to control thrips. Gladioli may be used for a colour scheme in a border, and look their best when under-planted with annuals such as petunias or annual phlox.

Bulbs

The leaves of spring flowering bulbs are now dying down and as a result making the garden look untidy. The removal of the foliage is not recommended, as it reduces the supply of food being returned to the bulbs. It is better to tie the leaves in a loop and remove the loop later when it has ceased to be of use. This stage is reached when it comes away easily from the bulb.

Weeds

Not only flower plants come into growth in spring, but also weeds shoot up, often more vigorously than the cultivated plants. To keep the garden as clean as possible weeds should be killed before they have time to set seed. A push hoe is excellent for this purpose and by hoeing once a week the weeds should be kept satisfactorily under control. Unless the day is very hot and dry, it is better to remove and destroy weeds, as if they are left lying on the soil, there is a chance that immature seed will ripen or the plants will re-root.

The use of weedkillers on lawns will be most effective while the weeds are still in active growth and before they have begun to set seed. Lawns that are to be treated should be left uncut for a week beforehand to ensure a large leaf area on the weeds and left for several days after the weedkiller has been applied.

If hormone weedkillers are used, a watering can is better than a spray pump for applying them, as there is little or no spray drift with the coarse spray at low pressure, and therefore less risk of damaging plants in nearby flower beds.

GARDEN WORK FOR OCTOBER

Elliott

Shirley poppies do best when the seed is sown in the position in the garden where plants are to grow.

Volatile hormone weedkillers are unsuitable for use in the confined space of a garden, because vapours from the material may seriously damage garden plants even a considerable distance away.

Non-volatile materials are much safer to use on lawns. The treatment should always be done on a calm day not only because of the drift but also to ensure that the correct amount is applied to the weeds. When the weeds have died they should be raked off and burnt. If there are any bare patches left, they may be topdressed with soil and resown in grass.

Any equipment that is used for spraying hormones should be kept for that purpose only, as no matter how thoroughly it is washed sufficient residue may be left to have a harmful effect, especially on roses, tomatoes, and grapes, which are particularly susceptible to hormone damage.

Tulips

Tulips are among the many plants that show symptoms of virus infection only when they are actually in flower. The indication of virus is a white striping of the flower, and before the cause of this was known the infected bulbs were often kept and treated as novelties. Where striped flowers occur the bulbs should be dug up and destroyed, as there is no cure for virus infection, and if they are left, they provide a source of infection for clean, healthy plants to which the disease is carried largely by aphides.

The treatment described for the foliage of early flowering bulbs also applies to tulips. To get the maximum development of bulbs the flowers should be cut off as soon as they are finished, because the formation of seed heads means that less food will be available for storing and the development of flowers for next year.

Pests and Diseases

Slugs and snails are usually found to be feeding on the fresh young growths of many plants during spring. They can be controlled easily by putting out metaldehyde poison baits. Aphis builds up large populations in spring and early summer. These should be controlled not only because they weaken the plants on which they are feeding, but also because in many cases they are the main transmitters of virus diseases. Nicotine sulphate or HETP sprays are quite effective for controlling these insects, but lindane dusts or sprays have a longer residual effect on them.

Preventive sprays for fungous diseases should be applied, as once a fungus has become established it is very hard to control satisfactorily. For the small home garden bordeaux mixture is probably still the best fungicide to use, and for larger areas where the extra expense is warranted thiram is very effective. Roses can be treated with a combination of thiram and sulphur, which will control black spot, rust, and powdery mildew.

Embroidered Cardigan

THE cardigan described here will be just the thing for keeping out the chill on nippy evenings. It features an unusual and attractive embroidered floral design.

MATERIALS: 6oz. of 3-ply knitting wool; 2 No. 12 and 2 No. 14 knitting needles; 7 buttons; a few yards of wool in various bright colours.

Measurements: Bust, 34in.; length from shoulder, 16in.; sleeve seam, 5in.

Abbreviations: K., knit; p., purl; st., stitch(es); st.st., stocking stitch; rep., repeat; patt., pattern; cont., continue; beg., beginning; tog., together; inc., increase; dec., decrease; rem., remain (ing).

Tension: 9 st. to 1in.

The Back

Using No. 14 needles, cast on 102 st., and work in k. 1, p. 1 rib for 2in.

Next row: K. 4, * k. twice into next st., k. 3. Rep. from * to last 6 st., k. twice into next st., k. 5 (126 st.).

Next row: P.

Continue in st.st. until work measures 4in. from beg. Change to No. 12 needles and cont. in st.st., inc. 1 st. at both ends of 4th row and every following 3rd row until there are 152 st. Cont. straight until work measures 9in.

Shaping Armholes

Cast off 4 st. at beg. of next 2 rows, then dec. 1 st. at both ends of every row until 126 st. rem.

Cont. straight until work measures 16in.

Shaping Shoulders

Cast off 12 st. at beg. of next 2 rows, then 11 st. at beg. of next 6 rows.

Cont. in st.st. on rem. st. for ½in. Cast off.

The Right Front

Using No. 14 needles, cast on 64 st. and work in k. 1, p. 1 rib for 3 rows.

Next row: Rib 10, cast off 3, rib to end.

In next row cast on 3 st. in place of those cast off. Cont. in rib, making 2 more buttonholes at ¾in. intervals (measured from cast-off edge of previous buttonhole) until work measures 2in., finishing at buttonhole edge.

Next row: K. 12, * k. twice into next st., k. 6. Rep. from * to last 3 st., k twice into next st., k. 2 (72 st.).

Next row: P.

Cont. in st.st. for 1½in., finishing at front edge.

Next row: K. 10, cast off 3, k. to end.

Next row: P. to last 10 st., cast on 3, p. 10.

Cont. in st.st. until work measures 4in.

Change to No. 12 needles and cont. in st.st., making 3 more buttonholes at front edge at 1½in. intervals, and at the same time inc. 1 st. at side edge on 4th row and every 3rd row following until there are 85 st.

Cont. straight until work measures 8½in., ending at front edge with the 7th buttonhole completed.

Shaping Neck

Next row: K. 5, work 2 tog., k. to end.

Next row: P.

Repeat these 2 rows until work measures 9in. ending at side edge.

← Basic embroidery pattern (half actual size).

EMBROIDERED CARDIGAN . . .

Shaping Armhole

Keeping continuity of front decreases, cast off 4 st. at beg. of next row, then dec. 1 st. at armhole edge on next 9 rows. Cont. straight at this edge, still dec. 1 st. at neck edge on alternate rows until 50 st. rem. Now work straight until front measures 16in. from beg., ending at armhole edge.

Shaping Shoulder

1st row: Cast off 12, work to end.

2nd row: Work to end.

3rd row: Cast off 11, work to end.

Rep. last 2 rows once, then end row again. Cast off.

The Left Front

Using No. 14 needles, cast on 64 st. and work in k. 1, p. 1 rib for 2in.

Next row: K. 2, * k. twice into next st., k. 6. Rep. from * to last 13 st., k. twice into next st., k. 12 (72 st.). Now work to match right front, omitting buttonholes and reversing shapings.

The Sleeves

Using No. 14 needles, cast on 90 st. and work in st.st. for 1in., ending with a p. row.

Make a hem in the next row thus: Fold work in halves with wrong side inside and k. tog. 1 st. from needles and 1 st. from cast-on edge all along the row. Cont. in st.st. for ½in.

Change to No. 12 needles and work in st.st., inc. 1 st. at both ends of next row and every following 3rd row until there are 112 st. Cont. straight until sleeve measures 5in.

Shaping Top

Dec. 1 st. at both ends of alternate rows until 74 st. rem., then dec. 1 st. at both ends of every row until 54 st. rem. Cast off 3 st. at beg. of next 6 rows. Cast off rem. st.

To Make up

Press work on wrong side with a hot iron and damp cloth. Join the shoulder together.

While work is in the flat stage work the embroidery. Follow the chart for positions of flowers. The flowers and leaves are in stroke stitch, with French knots for centres. The stalks and the surround are in variegated couching stitch and the single stems are in stem stitch. Separate flowers are dotted round the main bunch.

Sew in sleeves, then sew up sleeve and side seams. Turn in ½in. hem round fronts and neck and herring-bone on wrong side.

Sew on buttons to match button-holes. Press all seams and hems.

Attractive Gingham Apron

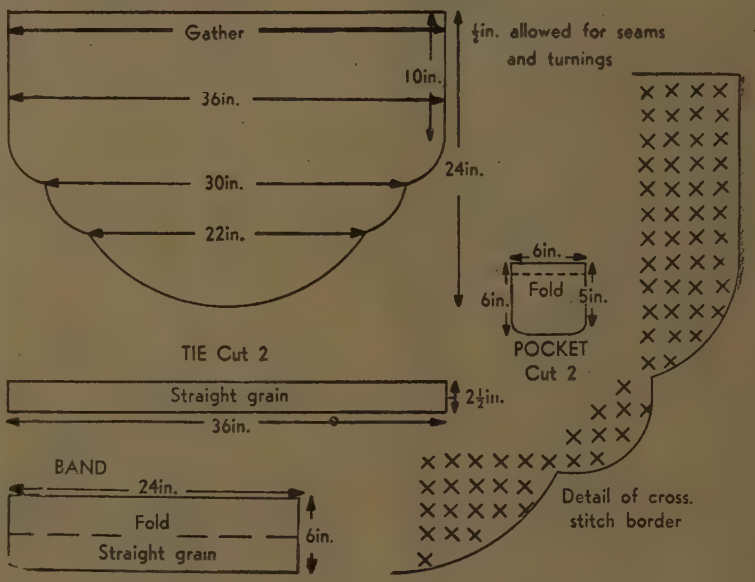
By BETTY M. JOHNSTON,
Field Officer in Rural Sociology,
Department of Agriculture, Wellington

CROSS stitch embroidery on checked gingham can be most effective and takes only a short time to do. The apron illustrated is attractive enough to be worn while serving up when guests come to dinner but is hard wearing and workmanlike too.

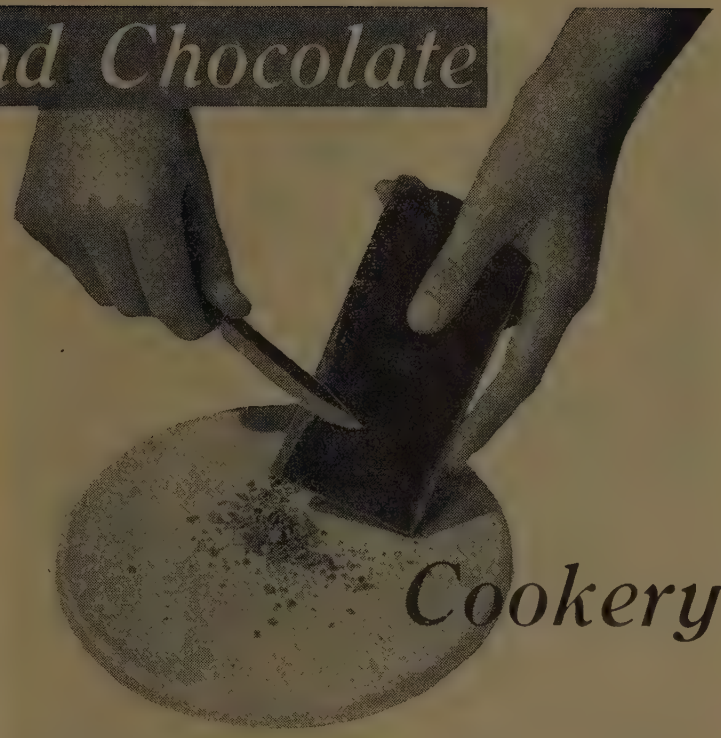
The materials required are 1yd. of blue and white checked gingham, 2¾yds. of white ric-rac braid, 1 skein of white stranded cotton.

All turnings and seams are machined and the ric-rac is attached by machine. The material is gathered on to a straight band, which should be long enough to allow the apron to lap round toward the back. The only hand sewing, apart from basting, is the cross stitch embroidery. Here a white St. Andrew's cross is made in each of the darker coloured squares to form a border. Directions for cross stitch were given in the article "Tapestry Embroidery", which appeared in the June 1954 issue of the "Journal".

A similar cross stitch border can be made on a gingham breakfast or lunch cloth.



Cocoa and Chocolate Cookery



Flaked chocolate can be made quickly this way when recipes require it.

THE botanical name for the cocoa bean is *Theobroma cacao*, a literal translation of which is "Cacao—food of the Gods", and there can be no doubt that in chocolate nature has provided one of the most delightful flavours. This article by Maud B. Strain, Field Officer in Rural Sociology, Department of Agriculture, Dunedin, has some recipes suitable for everyday use and others more appropriate to festive occasions but all depending on chocolate for their flavouring.

THE origin of chocolate is legendary, but it is known to have come from the New World. Columbus took cocoa beans back to Spain, but it was not until Cortez, the Spanish explorer and conqueror of Mexico, learnt from the Aztecs how to prepare the beans for culinary use that the beverage was introduced to Europe.

Manufacture

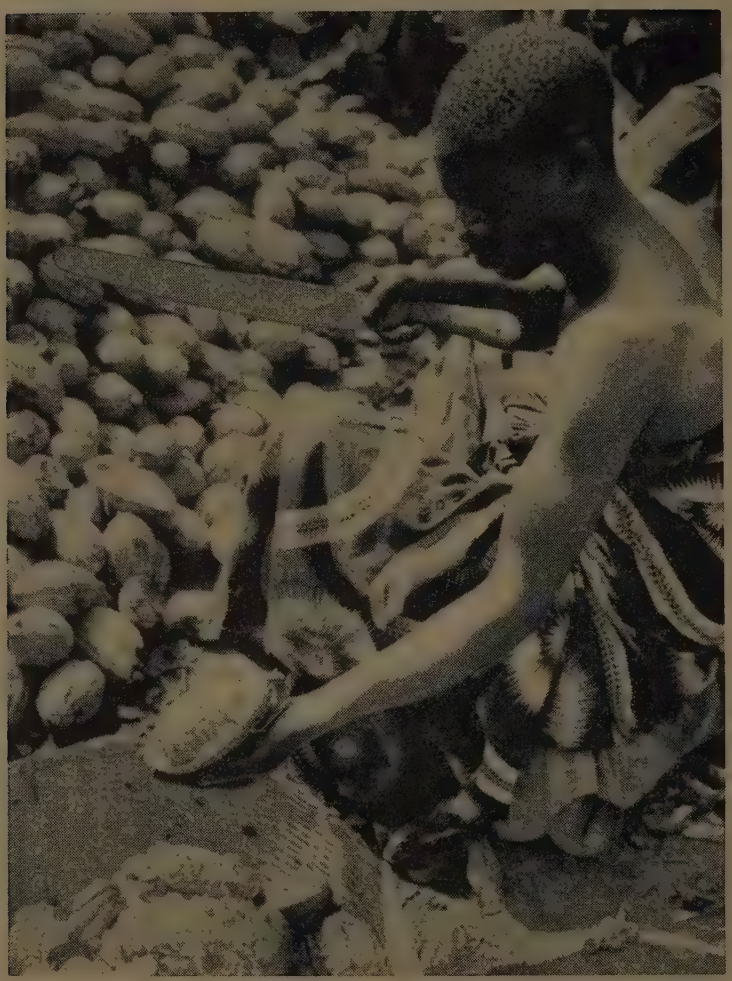
Cocoa and chocolate are both manufactured from the cocoa bean, the seed of a fleshy fruit which grows on a tree in shape and stature somewhat like an apple tree. It bears its fruit in pods which grow from both trunk and branches, and though it produces fruit all the year round, it is not a prolific cropper. The beans are encased in pods from 7in. to 12in. long, each pod containing 30 to 40 beans. The ripened pods are gathered and dried for 24 hours, after which they are cut open and the beans removed.

Cocoa pods grow on short stems from the trunk and branches. They are chopped off the trees with a short, sharp cutlass.

The beans undergo a series of processes including fermenting, removing the pulp, washing, drying, and roasting. The shells are cracked and the kernels broken into pieces known as cocoa nibs. The nibs are separated from the shells, heated, and ground. The result is plain, or bitter, chocolate. In the manufacture of cocoa part of the fat is removed and the resulting mixture is again ground, giving a dry powder. The fat content of chocolate is often 50 per cent. or more, and that of cocoa less than 8 per cent. Dutch process cocoa differs from ordinary cocoa in that it has been treated with an alkali. This gives it a red colour somewhat darker than the usual colour, removes some of the flavour, and tends to prevent settling out of the cocoa in the beverage.

Making Cocoa Drink

Chocolate and cocoa differ widely from tea and coffee both in the ingredients used and in method of making. The chief liquid used in their preparation is milk, whereas water is used for tea and coffee. In making cocoa the aim is to incorporate the cocoa, which has a high starch content, with a liquid. The method of



A cocoa pod slit open, showing the whitish cocoa beans.

preparation must be one in which the cocoa is so mixed with other ingredients as to separate the starch granules. It must be cooked with water to gelatinise the starch before milk is added.

This results in a less raw flavour and less tendency for the cocoa to settle to the bottom of the beverage. When the milk has been added and heated almost to boiling point the cocoa is beaten with a rotary beater just before serving to prevent the formation of a skin on top or to break up any skin that may have formed. If desired, cocoa may be flavoured with a few drops of vanilla and garnished with a teaspoon of whipped cream or a marshmallow. Breakfast cocoa is served ungarnished.

Food Value

Good plain chocolate with its high percentage of fat and its sugar is a concentrated energy-giving food and makes a valuable contribution to the rations of people temporarily dependent for their food supplies on what they can carry with them. The high fat content makes it satisfying and sustaining and the sugar is a ready source of energy. Chocolate was included in war-time emergency rations and is carried by trampers, climbers, explorers, and others whose activities take them to places and under conditions where conventional meals are impracticable.

Cocoa as a beverage has little nutritional value because only a small amount of cocoa powder is used in a cup of cocoa; most of its nutritive value is provided by the milk and sugar.

Recipes

Chocolate may be grated, or cut into small pieces, or flaked, but recipes often require it to be melted. Because it scorches easily, it should always be melted over hot water. The water should not be boiling, because steam may come into contact with the chocolate and cause it to lump. Chocolate does not need to be grated or flaked before it is melted.

Some chocolate cake recipes call for extra soda in addition to the usual amount of baking powder. The effect of this extra soda is to make the cake a richer, redder colour, but tests have shown that though such a cake is richer in appearance, it is less chocolate in taste.

Sometimes chocolate turns a whitish colour. This is caused by the cocoa butter separating and rising to the surface during warm weather. It does not impair the eating qualities of the product.

It is usually advisable to use chocolate if the recipe calls for it; however, cocoa may be substituted in the proportion of 3 tablespoons of cocoa (¾oz.) and ½ tablespoon (½oz.) of fat in place of each ounce of chocolate. A "square" of chocolate as mentioned in recipes from the United States of America weighs 1oz. Chocolate beverage should be boiled for fullest flavour, but before the milk is added. If the milk is boiled, proteins from the milk will coagulate and form a skin on top. Beating the beverage after it has been taken from the range will give it a frothy surface and inhibit the formation of skin if the cocoa is allowed to stand.

Cocoa has a tendency to lump in hot liquid and should be treated like starch—that is, mixed with sugar and/or other ingredients and blended with a cold liquid before hot liquid is added.

In the following recipes standard measuring cups (8 fl. oz.) and standard measuring spoons are used. All measurements are level.

Beverages

Chocolate

1oz. of dark chocolate
2 to 4 tablespoons of sugar
¼ cup of hot water
3¾ cups of scalded milk
Few grains of salt

Break the chocolate into small pieces and mix them with the sugar and salt. Add the water and boil the mixture until it is smooth and glossy, stirring as required. Add the milk and reheat the mixture. Beat with a rotary beater before serving.

Cocoa Paste

4oz. of cocoa
4oz. of sugar
1 pint of boiling water

Mix the cocoa and sugar together and add the boiling water gradually. Boil for 5 minutes, stirring all the time, and cool and store in screw-top jars. Use 1 or 2 teaspoons of cocoa paste to each cup of milk.

Chocolate Syrup

1oz. of dark chocolate
2oz. of sugar
⅔ cup of hot water
¼ teaspoon of vanilla
Few grains of salt

Break up the chocolate and add the sugar, salt, and water to it. Mix these together and boil for 5 minutes, stirring constantly. Cool the mixture and add the vanilla. Bottle in a screw-top jar with a rubber ring and reseal whenever the jar is opened. Store in a cool place. Allow 1½ tablespoons of syrup to 1 cup of hot or cold milk.

French Chocolate

Place a large spoonful of chocolate sauce 1 (described below) in a serving cup. Fill the cup with hot milk and stir the contents until mixed.

Sauces

Chocolate Sauce 1

2½oz. of dark chocolate
½ cup of water
5oz. to 6oz. of sugar
1 cup of whipped cream

Cook the chocolate in the water until it is thick, stirring constantly to prevent sticking. Add the sugar and heat to boiling point. Cool the mixture and fold in the whipped cream.

Use this as a sauce for ice cream or for French chocolate.

Chocolate Sauce 1

3oz. of dark chocolate
½ pint of milk or boiling water
1oz. of melted butter
4oz. of sugar
½ teaspoon of vanilla

Melt the chocolate slowly in the double boiler, add the butter, and when the mixture is thoroughly blended pour the milk (or boiling water) on gradually, stirring constantly. Add the sugar, bring to the boil, and boil gently for 10 minutes. Cool slightly before adding the vanilla. This sauce thickens on standing and may be thinned with milk or cream. Serve hot or cold.

Variations

Chocolate Mint Sauce

Reduce the chocolate to 2oz. Omit the vanilla and scald 3 tips of mint with the milk or add 2 tablespoons of creme de menthe.

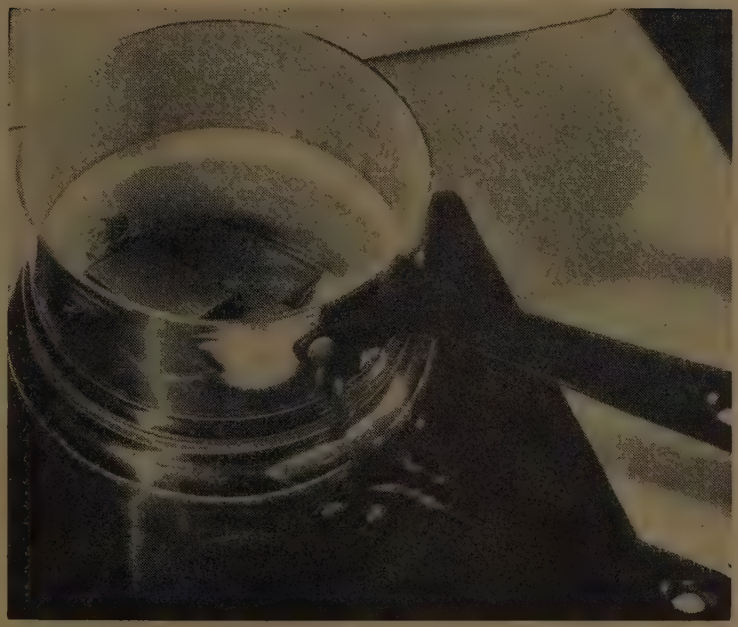
Creamy Chocolate Sauce

Use cream instead of milk and increase the butter to 1½oz.

Chocolate Caramel Sauce

4oz. of chocolate
2oz. of butter
12oz. of light brown sugar
1 cup of hot water
1 teaspoon of vanilla

Melt the chocolate and butter over hot water, add the sugar, and mix it



Chocolate should always be melted over hot water.

Previously cooked cocoa paste enables mugs of steaming-hot cocoa to be ready at a moment's notice.

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well in. Add the water and cook the mixture over direct heat until it boils, stirring constantly. Boil until the mixture becomes syrupy (10 to 15 minutes), remove from the fire, and cool slightly before adding the vanilla essence.

Serve hot on cottage pudding and similar desserts or on ice cream.

Milk Puddings and Custards

Chocolate Junket

2 cups of milk
2 teaspoons of sugar
2 teaspoons of cocoa
½ teaspoon of vanilla
½ cup of water
1 teaspoon of rennet

Heat the milk to body temperature. Combine the cocoa, sugar, and water, and cook to a thick paste. Blend this with the warm milk. Pour the mixture into a serving dish and add the rennet and vanilla. Stir the mixture for ½ minute or less, then leave it undisturbed in a warm place until it sets. Chill for a short time and garnish with whipped cream.

Chocolate Creamy Rice

Place 1 pint of milk to heat in a buttered saucepan (this prevents burning). Blend together 2oz. of rice and 2oz. of brown sugar. As the milk comes to boiling point shake in the mixed rice and sugar, stirring constantly. Continue stirring until the pudding thickens, then add 2oz. of grated chocolate and keep stirring until it has all melted. Pour the mixture into a greased pie-dish and bake in a moderate oven (350 degrees F.) for 25 to 30 minutes.

Variations

Sago, semolina, flaked tapioca, or pearl barley may be used in place of rice.

Crispy Chocolate Pudding

Before putting creamy rice into the oven spread over it a topping made by blending together 2oz. of creamed butter, 2oz. of sugar, and 2oz. of wholemeal or rolled oats. Bake at 400 degrees F. until the topping is crisp and brown.

Chocolate Bread and Butter Custard

Sliced buttered bread
2oz. of currants
2oz. of sultanas
2oz. of brown sugar
2 eggs
1oz. of cocoa
1 pint of milk

Butter a 2lb.-size pie-dish. Clean the fruit and mix it with the brown sugar. Make a custard by beating the two eggs and adding the milk and cocoa (mixed together). Put alternating layers of buttered bread and fruit mixture in the pie-dish until it is three parts full, finishing with a fruit layer. Pour the custard over this and let it stand for 15 minutes while the bread absorbs some of the liquid. Bake in a moderately hot oven (375 degrees F.) for 35 to 40 minutes until the custard has set and the pudding has browned.

Chocolate milk shakes are quickly prepared from chocolate syrup, which may be made in bulk and stored in screw-top jars.

Chocolate-custard Bread Pudding

1oz. of dark chocolate
3½ cups of milk
2 cups of 1in. cubes of day-old bread
3 lightly beaten eggs
6oz. of sugar
¼ teaspoon of salt
½ teaspoon of vanilla
½oz. of melted butter

Place the chocolate and milk in the upper part of a double boiler and heat over hot water until the chocolate has melted. Add the butter and stir well. Place the cubes of bread in a basin, pour the chocolate mixture over them, and let stand for 10 minutes.

Beat the eggs slightly and stir in the vanilla, sugar, and salt. Add this to the contents of the basin, combine thoroughly, and pour the mixture into a greased pie-dish.

Stand the pie-dish in a pan of hot water and bake in a moderate oven (350 degrees F.) until the custard has set (about 1 hour).

Puddings

Chocolate Pudding Steamed

7oz. of flour
1oz. of cocoa
1oz. of grated chocolate
4oz. of butter
Few grains of salt
4oz. of sugar
2 well-beaten eggs
3 tablespoons of milk
2 teaspoons of baking powder

Combine the flour, sugar, cocoa, chocolate, salt, and baking powder in a bowl. Rub in the butter as finely as possible. Beat the eggs well and add the milk. Blend the wet ingredients with the dry ingredients and place the mixture in a greased pudding basin. Cover and steam it for 1½ hours. Serve with chocolate sauce 2.

Chocolate Cottage Pudding

9oz. of flour
4 teaspoons of baking powder
¼ teaspoon of salt
4oz. of butter
1oz. of cocoa
5oz. of sugar
2 eggs
¼ pint of milk
½ teaspoon of vanilla essence

Sift the flour, baking powder, salt, and cocoa together twice. Cream the butter and add the sugar gradually. Add the eggs one at a time, beating each one well in. Add the vanilla essence to the milk. Add the flour and milk alternately to the creamed mixture and blend all together. Pour into a greased pan and bake 25 to 35 minutes in a moderate oven (350 degrees F.). Serve with hot chocolate caramel sauce.

Souffles

Chocolate Souffle 1

1 cup of milk
2oz. of dark chocolate
1½ cups of cake crumbs
4oz. of sugar
½ cup of chopped nuts
¼ teaspoon of salt
4 eggs

Heat the milk with the chocolate in the upper part of a double boiler. When the chocolate has melted add the cake crumbs and blend until the milk is absorbed. Add the nuts, salt, and egg yolks beaten with half the sugar. Beat the egg whites stiffly with the remaining sugar and fold them

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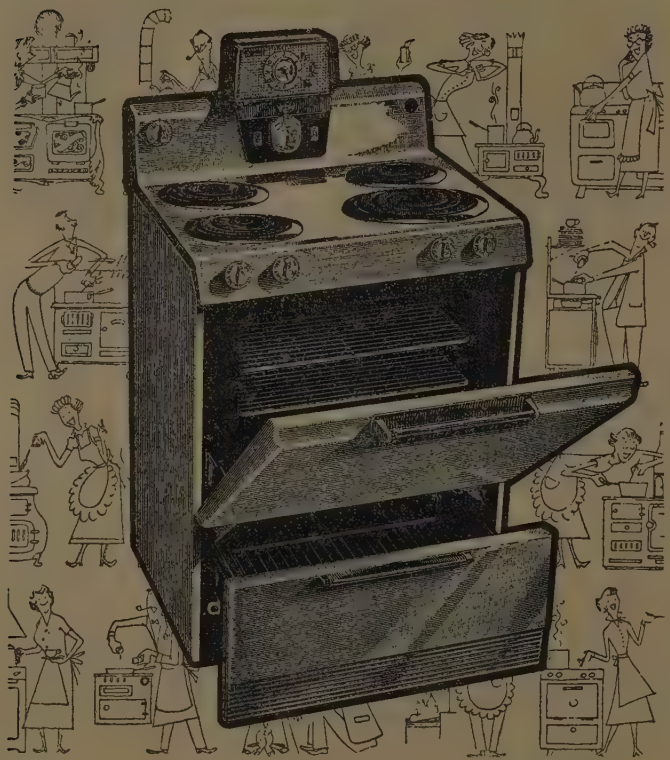

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into the cake mixture. Turn into a buttered baking dish and bake in a moderate oven (350 to 375 degrees) for about 45 minutes.

Chocolate Souffle 2

3 eggs
½ teaspoon of salt
3 tablespoons of butter
3 tablespoons of flour
1 cup of milk
2 tablespoons of cocoa
2 tablespoons of sugar
¼ cup of water

Make a thick white sauce by melting the butter, stirring in the flour, cooking for 1 minute, then adding the milk gradually, beating the mixture to a smooth texture after each addition. Mix the cocoa, sugar, and water and cook to a thick paste. Combine this mixture with the white sauce. Separate the yolks from the whites of the eggs. Beat the egg whites until the peaks fold over when the beater is removed. Beat the egg yolks until very thick. Blend the egg yolks with the sauce mixture and fold this carefully into the egg whites. Pour into an ungreased baking dish, filling not more than two-thirds full. Set the dish in a pan of hot water and bake in a moderate oven (350 degrees F.) until firm (about 45 to 60 minutes).

Pies

Chocolate Cream Pie

2oz. of dark chocolate
2 cups of milk
6oz. of castor sugar
1½oz. of flour
¼ teaspoon of salt
2 eggs
1oz. of butter
1 teaspoon of vanilla
9in. baked pie shell
Whipped cream

Blend the sugar, flour, and salt together with sufficient of the cold milk to make a thin creamy mixture. Heat the rest of the milk with the chocolate in the top part of a double boiler over boiling water, stirring until the chocolate has melted. Stir a little of the hot milk mixture into the cold milk mixture, then return the mixture to the saucepan, and keep stirring until it has thickened. Allow this to cook, stirring as required for a further 10 minutes. Beat the eggs and stir a small quantity of the hot mixture into them. Pour this back into the thickened mixture while stirring vigorously. Cook for a minute, then add the butter. Remove from the heat and cool slightly before adding the vanilla. Pour this into the baked pie shell and serve hot or cold. Serve with whipped cream.

Coconut Variation

Add ½ cup of coconut to the beaten eggs before stirring them into the mixture.

Banana Variation

Pour a little of the filling into the pie shell. Cover it with a layer of sliced bananas. Add the rest of the filling and decorate with a ring of sliced bananas and whipped cream.

Meringue Variation

In making the filling use only the egg yolks. Beat the whites stiffly and fold in 3oz. of sugar. Pile this on top of the filling and brown lightly in a moderate oven (350 degrees F.).

Chocolate Chiffon Pie

½ cup of strong coffee
2oz. of dark chocolate
1 tablespoon of gelatine
¼ cup of cold water
3 egg yolks
4oz. of sugar
¼ teaspoon of salt
1 teaspoon of vanilla
4oz. of sugar
3 stiffly beaten egg whites
1 9in. baked pie shell

Heat the coffee and chocolate in the top part of a double boiler over hot water until the chocolate has melted and the liquid is hot. Remove from the heat. Soften the gelatine in the cold water, add it to the hot mixture, and stir until dissolved. Beat the egg yolks until light and lemon coloured, beat in ½ cup of sugar (4oz.), and add the salt and vanilla. Gradually stir in the chocolate mixture. Chill until partially set, then stir until smooth. Beat the remaining 4oz. of sugar into the egg whites. Fold this into the chocolate mixture and chill until partially set, then pile it into the cooked pie shell. Top with whipped cream and sprinkle with decorettes.

Chocolate Gateau

4oz. of castor sugar
4oz. of butter
2oz. of grated chocolate
2 eggs
3oz. of flour
1oz. of ground rice
1oz. of ground almonds

Cream together the castor sugar and butter until light and fluffy. Add the grated chocolate, then the eggs one at a time, beating the first egg well in before adding the second. Sift together the flour, ground rice, and ground almonds and stir them lightly into the creamed ingredients. Pour the mixture into a lined caked tin and bake for 40 to 50 minutes in a moderate oven (375 degrees F.). When baked, cool and split. Sandwich with chocolate-flavoured whipped cream and cover completely with chocolate water icing. Decorate and serve.

Cakes

Chocolate Cake

4oz. of butter
4oz. of sugar
2 eggs
2 teaspoons of baking powder
6oz. of flour
2 tablespoons of cocoa
2 to 3 tablespoons of milk

Soften the butter and cream it with a wooden spoon until light coloured. Add the sugar gradually, creaming the mixture thoroughly after each addition until it is light and fluffy. Beat the eggs until light and foamy. Add the beaten egg gradually to the butter and sugar mixture and beat thoroughly. Sift the flour, baking powder, and cocoa together and stir one-quarter of it into the egg mixture until it is just blended. Add the milk and the rest of the flour mixture alternately and mix thoroughly. Turn into two 7in. sandwich tins lined with lightly greased grease-proof paper and bake in a moderate oven (360 degrees F.) for 20 to 30 minutes or in a similarly prepared 7in. loaf-cake tin and bake at 340 degrees F. for 45 to 60 minutes.

Cool in the tin for 10 to 15 minutes, then remove the cake from the tin and allow it to cool on a cake rack before filling or icing.

[Sparrow

Served with hot chocolate sauce plain ice cream becomes a special-occasion dessert.

This banana garnish has more than eye appeal. It adds a pleasing extra flavour to this chocolate ice cream pie.

Chocolate Sponge Roll

3 eggs
4oz. of sugar
4oz. of flour
3 teaspoons of cocoa
1 teaspoon of baking powder
2 tablespoons of warm water

Line a 13in. x 11in. sponge roll tin with greased paper. Whisk the eggs, sugar, and water until thick and creamy. Fold in the flour sifted with the baking powder and cocoa. Spread evenly in the prepared tin and bake in a moderately hot oven (375 to 380 degrees F.) for 12 to 15 minutes.

Trim off the edges quickly and turn on to a clean, dry tea towel. Spread with heated apricot jam. Roll up and leave in the cloth on a cake rack to cool. This roll is sometimes covered with chocolate butter icing.

Chocolate Dessert Squares

6oz. of flour
1 teaspoon of baking powder
½ teaspoon of salt
2oz. of butter
3oz. of melted chocolate
7oz. of sugar
1 well-beaten egg
½ teaspoon of vanilla
¼ pint of milk

Sift together the flour, baking powder, and salt. Add the butter to the melted chocolate and blend. Combine the sugar and egg. Add the chocolate mixture, beating thoroughly. Add the vanilla to the milk. Add the milk and flour alternately to the chocolate mixture, blending well after each addition. Pour into an 8in. x 8in. tin lined with greased paper. Bake in a moderate oven (350 degrees F.) for 15 to 20 minutes. When cool top with chocolate frosting. This mixture will make nine 2⅔in.-square pieces.

Chocolate Raisin Nut Squares

Mix in 2oz. each of raisins and nuts (both chopped) to the chocolate mixture in the last recipe, and then pour it into the cake tin.

Chocolate Waffles

2 cups of flour
1 tablespoon of baking powder
1 teaspoon of salt
2 eggs (separated)
1¼ to 1½ cups of milk
½ cup of melted butter
¼ cup of sugar
6 tablespoons of cocoa

Sift the dry ingredients into a bowl. Beat the egg yolks and add the milk. Make a "well" in the centre of the dry ingredients. Pour the egg and milk mixture into the well. Stir quickly with a woden spoon until the flour is just dampened. Fold in the melted butter. Beat the egg whites to a stiff foam stage and fold them into the batter. Cook on a hot waffle iron according to manufacturer's directions.

Chocolate Bread

12oz. of sifted flour
3 teaspoons of baking powder
5oz. of brown sugar
1 teaspoon of salt
10oz. of milk
1 well-beaten egg
2oz. of melted fat
2oz. of melted chocolate

Sift the flour, salt, sugar, and baking powder together. Blend the egg with the milk and add to the dry ingredients. Add the fat and chocolate last. Place the ingredients in a greased bread tin and allow to rest for 20 minutes. Bake at 350 degrees F. for about 1 hour.

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